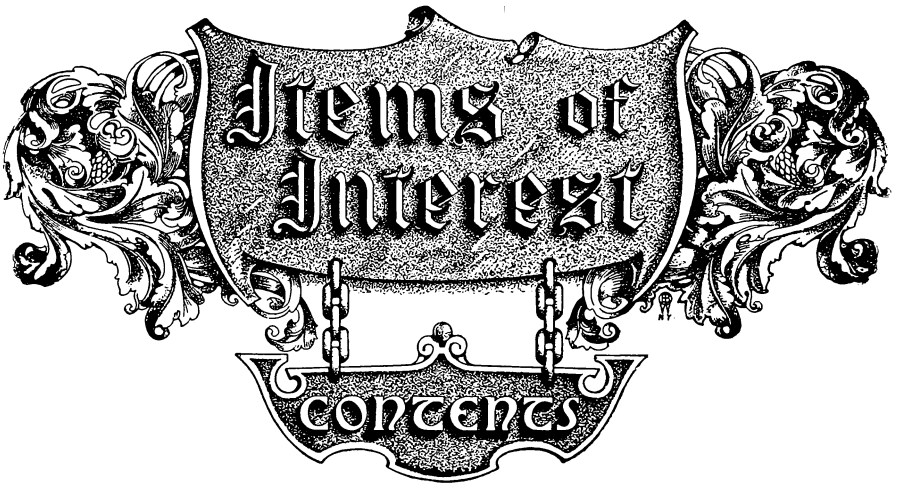

Exclusive Contributions

Prosthodontia

Orthodontia

Society Papers

Society Discussions

Editorial

CONTENTS—Continued

In Memoriam

Society Announcements

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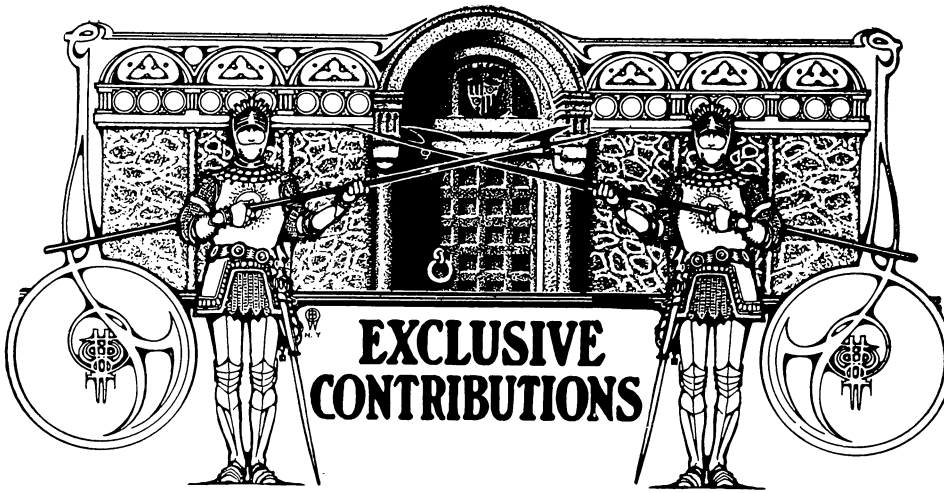


Minor and Major Oral Surgery.*

By Morris I. Schamberg, D.D.S., M.D., New York.

Professor of Oral Surgery, Dental Department, Medico-Chirurgical College of Philadelphia.

Suppuration.

Derivation. The term suppuration is derived from the Latin *suppuratio,* from *suppurare,* to form pus.

Definition. Suppuration is pus formation. It is the disintegrating or peptonizing influence of pyogenic organisms upon tissue cells.

Etiology. While pus producing organisms are the direct or exciting causes of suppuration there are predisposing factors, both local and general, which have much to do in determining the degree of activity of the invading microorganisms. Persons in good health will ofttimes resist the noxious effect of pathogenic organisms through the vital resistance displayed by normal tissues. In general it might be said that all persons suffering with, or convalescent from, systemic disease, are more susceptible to suppurative processes. Thus latent inflammatory foci about the teeth and jaws frequently become active when the patient's resistance is below par, an acute coryza or a grippe attack being sufficient to precipitate an active

alveolar abscess. Pus organisms, however, must always be present when suppuration takes place. Experiments have been conducted by the hypodermic injection of irritating substances, such as turpentine, calomel, nitrate of silver, etc., to determine the possibility of producing pus without the action of pyogenic organisms. A liquefaction necrosis, or breaking down of the tissue, takes place, forming a product which resembles pus, but which can not truly be called pus. The tubercle bacillus, which for a time was supposed to be a pus-producing organism because it created what is termed a "cold abscess," is now recognized as a pathogenic organism which does not form pus, but which causes a liquefaction, and at times cheesy necrosis, or death of tissue, in a similar manner to the irritating drugs experimentally employed. Only when a mixed infection occurs between the tubercle bacillus and pyogenic organisms is true pus found in tubercular foci. The presence in the system of toxic substances, which tend toward acute or chronic inflammations, naturally predisposes the host to suppurative changes. Thus alcoholic, rheumatic, gouty and diabetic subjects display a great tendency toward pyogenic infections. Particularly is this true of diabetic patients. The presence of sugar evidently renders living tissue a more favorable medium for the growth of pus-producing organisms. Poisoning with lead, mercury and phosphorus produces a morbid inflammatory reaction which frequently terminates in suppuration.

Avenues of Infection.

Pus organisms gain entrance into the system in many ways. They may be taken in with the air which we breathe, the water which we drink, and the food which we eat. Micro-organisms are to be found widely disseminated, occurring on the exposed surfaces of the body and in the various cavities communicating with the external air. The alimentary tract is in a measure protected against infection through the combative influence of its secretions. The skin surface of the body affords an excellent barrier against microbic invasion. Abrasions occurring on the body surfaces expose the underlying tissues to infection. In this manner and through wounds, pathologically, accidentally and surgically produced, do pyogenic infections usually occur. These are known as primary infections.

Secondary infections are brought about through the passage of infectious material from one part of the system to another. This may take place by *continuity* or direct extension, as when an abscess upon a tooth discharges into and infects the maxillary sinus, and by *contiguity* or extension through the lymph and blood vessels. The multiple asscesses set up in various parts of the body as a result of pyemia are called metastatic abscesses, or infection by metastasis.

The mouth, owing to its anatomic and functional relations with the respiratory and gastro-intestinal tracts, is constantly exposed to a large number of organisms. It stands out prominently as that portion of the body which harbors the greatest variety of bacteria. While many of them are non-pathogenic, there are, as a rule, a sufficient number of disease-producing organisms in the mouth to render it a most likely seat for primary infections. The teeth, owing to the fact that they invite the lodgment of food and other oral debris, and likewise tend to lower local resistance through irritation, are contributing factors in making the mouth a common seat for suppurations.

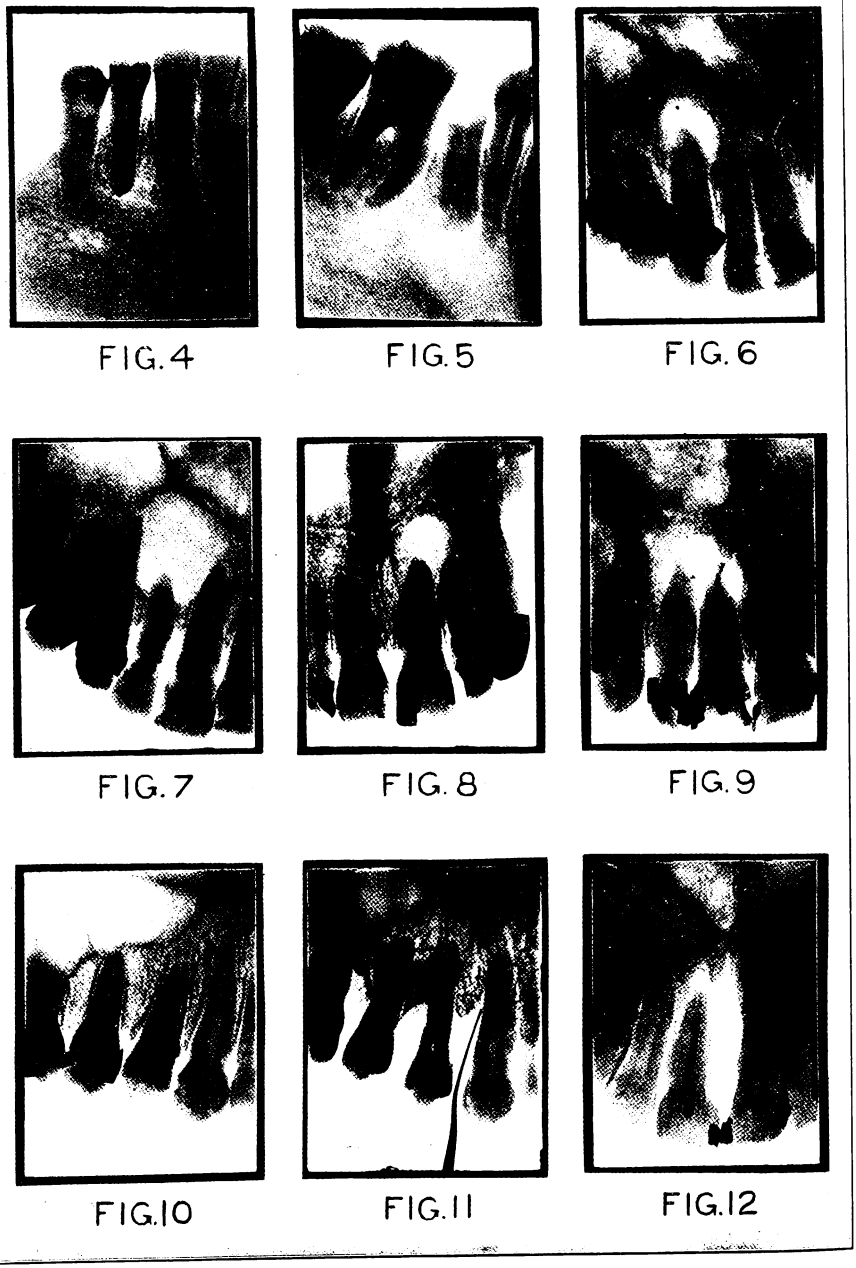
Alveolor abscesses, pyorrhea alveolaris, suppurative osteo-myelitis, infections about impacted teeth, suppurative adenitis, Ludwig's angina, etc., are forms of disturbances about the mouth due to the action of pyogenic organisms.

Pyogenic Organisms.

The two most common of the pus-producing organisms are the staphylococcus and the streptococcus.

1. *Staphylococcus pyogenes aureus, albus,* and *citreus.* These are organisms which are prevalent in the mouth as well as in other parts of the body freely exposed. They produce localized or circumscribed suppurations, and in the mouth will be found to be a factor in the causation of pyorrhea alveolaris, and other infections resulting in localized pus formations. Figs. 4, 5, 6, 7, 8, 9, 10, 11 and 12 are radiographs showing suppurative areas about the teeth, such as result from staphylococcic infections. The distinguishing names are given the three characters of staphylococci by reason of the color of the cultures on artificial media, *aureus* signifying orange or golden; *albus,* white; and *citreus,* yellow. Under the microscope these organisms appear as minute punctate bodies arranged in groups or clusters.

2. *Streptococcus pyogenes.* This organism may be found in similar places to the staphylococci, but in fewer numbers and with less frequence. It produces a diffuse suppuration—a phlegmon. Streptococcic infections spread rapidly, producing an extensive and active inflammation with, as a rule, little pus formation, but considerable edema or swelling. Fig. 13 is a photograph of a patient suffering from a streptococcic infection originating about the angle of the lower jaw. The swelling, or edema, which extended up the side of the face, causing the closure of the eye, disappeared shortly after the evacuation of pus and the removal of a spicule of fractured alveolus. Streptococcic infections are, as a rule, accompanied by pronounced constitutional symptoms, which, combined with the high degree of local disturbance, may seriously put in jeopardy



Radiographs showing some local results from staphylococcic infections.

the life of the patient. Under the microscope streptococci are found to be punctate bodies arranged in chains. The *streptococcus erysipelatis* presents a similar appearance to the streptococcus pyogenes, the only distinguishing feature being its large size. Other pus-producing organisms that are found in relation with suppurations about the mouth are the *pneumococcus,* or *diplococcus pneumoniae,* and the *bacillus pyocyaneus.* There are other pyogenic organisms, but they are so infrequently found in the mouth lesions that they will not be considered here.

3. *The diplococcus of pneumonia* was found by Kirk in pericemental abscesses, and by Schreier in about 75 per cent. of apical abscesses. These organisms are found normally in many mouths.

Description of Radiographs.

Fig. 4. An incipient abscess about the apex of a lower first bicuspid tooth. The light area in the radiograph illustrates the breaking down of the peri-apical tissues prior to the formation of a circumscribed abscess. The light area beneath the second bicuspid tooth is the mental foramen. Before the patient was sent to the author for advice, the second bicuspid, which exhibited caries in the crown of the tooth, had been opened and treated through the pulp canal, without relief from the pain, which was equally present in all the teeth of that region. The radiograph disclosed the tooth at fault, which was found to contain a dead pulp.

Fig. 5. An acute suppurative process involving the cancellous portion of the mandible in the lower bicuspid region. The infection, though it emanated from a second bicuspid root, had extended beneath the first bicuspid and posteriorly beneath the molar tooth.

Fig. 6. A localized abscess upon an upper cuspid tooth bearing a Richmond crown. The apical end of the root canal as shown in the picture had not been properly sealed.

Fig. 7. An extensive suppuration in the region of the upper lateral incisor. The abscess extends to and is in relation with the roots of the cuspid and central incisor, and also threatens involvement of the antrum and the floor of the nose.

Fig. 8. An abscess about the root of an upper central incisor which extended to and involved the apical region of a lateral incisor, the pulp of which tooth was found to be vital.

Fig. 9. The simultaneous appearance of abscesses upon the upper central and lateral incisor teeth, the root canals of which had been filled. Both roots show evidence of resorption, and in the central incisor a portion of the filling material is projecting into the abscess cavity.

Fig. 10. A circumscribed abscess in the floor of the antrum of Highmore. It is attached to the end of the second bicuspid tooth, and is the result of a putrescent pulp. The patient was referred to the author for the surgical treatment of the first bicuspid, which tooth was suspected as causing the distress in that region. The radiograph, however, cleared the diagnosis.

Fig. 11. Suppurative pockets causing resorption of the alveolar process about the gingival borders of the teeth. The scaling instrument which was used for the removal of deposits from the roots is shown in position at the depth of the pocket in the distal surface of an upper cuspid tooth.

Fig. 12. An extensive suppuration on the mesial side of an upper central incisor. The light area indicates the extension of the suppuration to the nasal floor. This the author found to be true, for when he curetted the affected bone he placed his finger in the nose and felt the instrument beneath the mucous membrane.

4. The *bacillus pyocyaneus* is occasionally found in suppurations about the mouth, imparting the bluish, or bluish-green color to pus.

It is highly probable that in the malignant infections occasionally spreading from the mouth to the throat and neck, in which the parts become not alone edematous, but emphysematous as well, that the *bacillus aerogenes capsulatus* is one of the offending organisms.

FIG. 13.

Streptococcic infection originating at the angle of the lower jaw, spreading upward, causing closure of the eye through a marked inflammatory edema.

Pus. Pus is the product of suppuration. It is, as a rule, a thick, white, creamy opaque fluid, and is made up of broken down tissue cells, degenerated white blood corpuscles (pus cells), *liquor sanguinis* and pyogenic organisms. It varies in consistency, color, odor, etc., depending upon the tissue involved and the organisms responsible for the infection. It is variously spoken of as *sanious* pus, when it contains blood; *ichorous* pus, when it is watery and has an acid reaction; *muco-pus,* when it is mixed with mucus; *fetid* pus, when it contains gases, the result of putrefactive organisms; *cheesy* or *curdy* pus, when it is thick and flakey, as is noted

in tubercular and bone abscesses; *gummy,* when it is thick and ropey, and comes from syphilitic lesions; *infective* pus, when it contains pathogenic micro-organisms. So-called *healthy,* or *laudable,* pus is the exudation found upon healing wounds, the pus organisms of which have been destroyed, and being no longer active, the discharge is non-irritating, and is without an offensive odor or taste.

Types of Suppuration.

Suppuration manifests itself upon free surfaces and within tissues.

When it occurs upon mucous membranes in the form of a purulent exudate without active destruction of the surface, it is known as *purulent catarrh.*

When suppuration takes place in one of the body cavities, or in a bony sinus, it is called *empyema,* or *purulent effusion.* When it occurs upon mucous or skin surfaces, and is accompanied by a loss of the continuity of the surface cells, it is known as *ulceration.*

Within tissues, suppuration usually takes place in localized areas, and forms circumscribed collections of pus, known as an *abscess.* When these are minute and occur in the hair follicles and sebaceous glands, they are called *pustules* (pimples). When the infection is more virulent and inflammation extends to greater depth, it becomes a *boil* or *furuncle.* If the inflammatory area spreads and multiple points of suppuration are created the lesion is called a *carbuncle.*

Suppurations may extend through the cancellous structure and myelin of bone, when it is called *suppurative osteomyelitis.* Diffuse infections involving the soft tissues in an extensive suppuration are known as *phlegmonous inflammations,* and are generally supposed to be the result of the streptococcus pyogenes. Suppurating tracts are known as *fistulae* and *sinuses.*

Symptoms.

The symptoms of suppuration are local and constitutional. The *local symptoms* are those which are present during acute inflammations, to which may be added pain indicating pus formation, or pus retention. Upon free surfaces the pain attending the formation of pus may be practically nil; there may be a slight burning sensation, or the pain may become severe and lancinating. When pus is enclosed it causes a throbbing pain, which may become intense and continuous if the pus is confined within bone, or other dense tissues. The presence of pus makes itself visually evident in catarrhal affections, upon ulcers, in pyorrheal pockets, and in fistulæ and sinuses. Superficial abscesses can ofttimes be detected through fluctuation, or the sensation imparted by the contained fluid during the alternate compression of the tumor by the fingers of the two hands. In deep seated and hidden abscesses associated with the

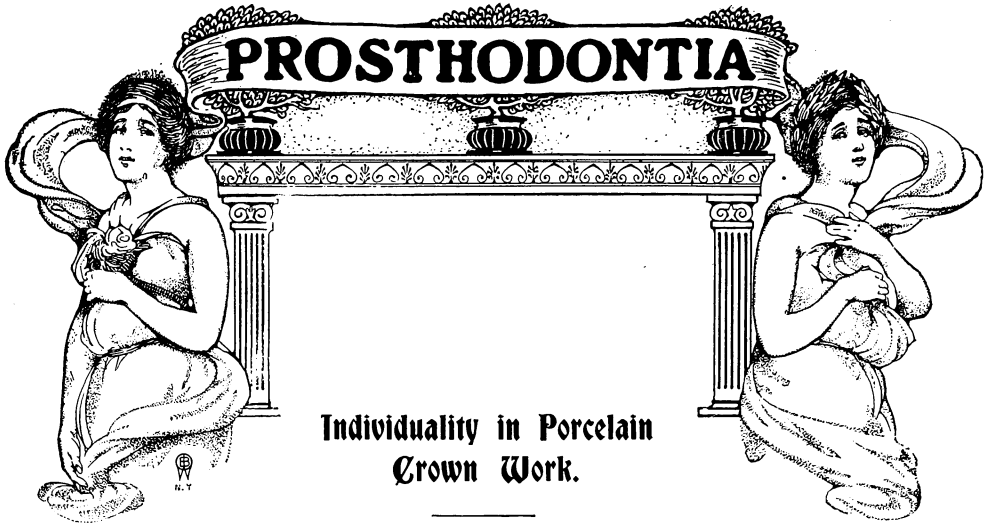
teeth and jaws, the X-ray is of distinct diagnostic value. (See radiographs, Figs. 4-12). The local symptoms of individual suppurative processes about the mouth will be considered in detail in chapters that are to follow, which will deal with local pathologic lesions of the mouth.

Constitutional Symptoms.

The *constitutional symptoms* consist mainly of fever, with its concomitants, the severity of which depends upon the location and extent of the infection, and the virulence of the organisms. The rise of temperature may be slightly above normal in mild infections, and in graver cases will reach 104 to 105 degrees F. With a high degree of temperature the patient suffers from other symptoms of toxic absorption, such as severe headache, gastro-intestinal disturbances (diarrhea or constipation), pain in the back and in the limbs; the urine will be found to be highly colored, the pulse full and bounding, later becoming rapid and weak if depression supervenes. Chills usually indicate pyemia, or the entrance of the pus organisms into the general circulation.

Treatment.

The treatment of suppuration may be divided into prophylactic and curative. *Prophylactic treatment* includes surgical asepsis and antisepsis, which will be dealt with in another chapter. It furthermore calls for thorough hygienic measures, which tend to keep the various parts of the body free from filth. About the mouth all forms of treatment which tend toward the restoration to the normal, and which are embodied in the practice of general dentistry, may be considered as preventive measures against suppuration infections. The *curative treatment* is divided into local and constitutional measures. The local treatment consists in assisting nature in ridding the part of the irritant. In catarrhal suppurations the bathing of the part with soothing antiseptics is ofttimes all that is necessary. In ulcerations the curette, together with caustic and digestic preparations, will serve the purpose of removing the slough from the tissue. Where pus is retained in the tissues free evacuation is indicated. For a long time the use of poultices, which would "bring boils to a head," and cause abscesses "to point," was considered proper treatment. Now most surgeons advocate a prompt evacuation of suppurating areas as soon as the presence of pus is determined. The constitutional treatment consists in building up the patient's health, utilizing the tonics and stimulants together with a good nutritious diet. Free catharsis will assist in eliminating toxic substances that accumulate in the intestinal tract, and by its depleting influence will benefit the local condition.



Individuality in Porcelain Crown Work.

By Dr. J. M. Thompson, Detroit, Mich.

Read before the Second District Dental Society, Brooklyn, N. Y.

In a recent issue of the Items of Interest appeared a plea for more natural forms of artificial teeth, and in the January number we, as a profession, were justly criticised by the editor for our lack of interest in this particular direction.

When the profession awakened to the fact that it wanted porcelain, it was produced in various forms, and we now have at our command materials from which beautiful results may be obtained.

The same thing will happen when we arise in our might and demand natural shapes in teeth and competent buyers in the depots who have the selecting of this particular stock.

The dealers are always willing to supply goods at a reasonable profit, and the teeth now obtainable are offered because they supply the general demand.

The dentist is the middleman, if you please, and it is to him that the public looks, not to the manufacturer. It is this responsibility that demands of us careful study of the needs of the individual, and not of the masses.

Our results in time give us our standing, and it is with a desire to plead for a high standard for all that I have selected the title of this paper.

In treating this subject not only is the individuality of the operator considered, but each tooth must be treated as an individual, a member

of a group of individuals, so to speak. This group in its normal state gives character to the person possessing it, and much depends upon its being preserved.

Many attempts to improve upon conditions found in some mouths often result in a less desirable appearance, owing to the lack of artistic sense in the operator, or to his limited knowledge of methods which may be applied to the case requiring his services.

Individuality of the operator is expressed in the degree of knowledge exhibited in the construction and artistic completion of a given case.

Perfect construction demands ability to assemble materials; also, a thorough acquaintance with the materials themselves. The artistic sense is displayed in various ways; a rounded surface here and a slope there; a softened outline where needed; proper contact with adjoining teeth; fine shadings of color, and, if necessary, imitating slight imperfections if such are present in adjacent natural crowns. A crown is never more in evidence than when placed between discolored or malformed natural crowns unless some attention is given to the two last mentioned particulars.

The dentist in this day of progress whose skill is limited to the use of commercial crowns, is not living up to his opportunities, as we now have at our disposal fine porcelains with which we are enabled to do more artistic work, and to become more valuable to the communities in which we live. With these materials more so-called worthless roots may be made to do service and testify to the skill of the dentist than any other known to the profession.

The history of the evolution which has taken place in the construction of the crowns during the last forty years is too voluminous to be considered at this time. However, the crown which may be used in the greatest number of cases involves ideas contained in the pivot tooth of Fauchard, the tube crown of Dr. Smith Dodge, of New York; the Lawrence or Foster crown, the Mack crown, the Gates-Bonwill, the How, the Weston, the Howland-Perry, the Logan, and the crown introduced by Dr. C. H. Land, known as the platinum jacket crown, the all-porcelain hood and overlap facing.

With slight alterations of shape and the use of metal instead of wood for dowels, the tube principle has survived all the others. This is proven by the numerous varieties of detachable post crowns now upon the market.

The crown with a fixed pin is rapidly falling into disuse, and men whose judgment can not be questioned claim a greater degree of strength for the crown into which a pin may be set with cement; also, that in proportion to the amount of metal baked into a piece of porcelain is the work correspondingly weakened.

The advent of the electric furnace has done more to make good crown work general than any other contrivance used by a dentist. This, with the production of desirable porcelain already mentioned, has at least made it possible to approach the ideal.

General principles pertaining to the construction of crowns have been described in text books and dental magazines for a sufficient number of years to have established the fixed principles.

Modifications of these principles, or some improvement in technique, is, therefore, all that writers of this period should lay claim to, and if credit for certain improvements is claimed, it should be done after first

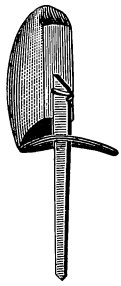


FIG. 1.

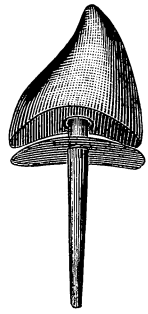


FIG. 2.

mentioning the originator of the crown modified. Original ideas are not always new ideas, and unless one is familiar with all that has been written, he makes a mistake in claiming for his own, ideas that may be from twenty to a hundred years old.

The office-made crowns of a few years ago consisted of an iridio-platinum dowel, a platinum cap or cope, through which the dowel extended far enough to enable one to solder the pins of a facing to it, or, by careful adjusting, bend the pins around it, thus holding it in place during the adding of the porcelain forming the lingual surface (Fig. 1). In selected cases this crown was good, but for general use was decidedly lacking.

In the first place, to be absolutely sure of the parts being properly assembled, it was necessary to invest and solder with pure gold; this not only consumed time, but added an element which later on proved a detriment, as the gold used in soldering would unite with, or be melted into, the porcelain and a weak spot formed near the post where strength was most needed; it also limited to quite an extent the artistic results.

Secondly, the platinum pins were, and are still, a menace to the success of the crown because of their liability to split the facing when work is placed in a warm furnace.

The use of a poor grade, or of a low fusing porcelain, upon the backs of facings is another source of trouble, and those who have tried it will admit that there is always an uncertain feeling as to the future of the work.

The advantages in the use of office-made crowns are many. The two principal features which present themselves are the adapting of the

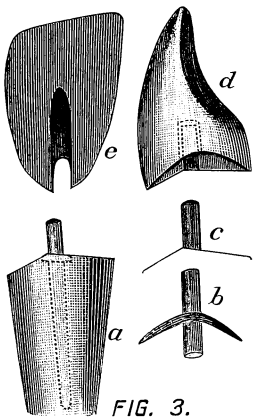


FIG. 3.

crown to the root, and not the root to the crown (as it is often found necessary in the use of a crown with a fixed pin), thus securing a greater degree of accuracy and individuality.

Fig. 2 shows the simplest method of mounting a commercial crown upon a platinum base when a crown with a fixed pin is desired. An iridio-platinum post is fitted into the root so that it has an equal bearing in all directions, which insures strength with a small amount of cement. When this is done it is removed and a disk of platinum placed over the end of the root, through which the pin is again forced into position. The two are then removed and united with a pellet of pure gold. Having done this and having placed the work in position, a slight blow with the mallet will seat the post firmly, so that the disk is easily swaged or malleted to fit the surface of the root. The part of the post remaining outside is then cut to the length necessary for attaching the crown.

A convenient swagger is readily made by the use of a new lead-pencil with a rubber eraser attached. By boring a hole in the eraser to

accommodate the end of the post, the rubber comes in contact with the platinum disk, forcing it to conform to the shape of the root. A cone socket handle also makes a good instrument with which to hold work in place.

When the base has been properly fitted a Davis crown is adjusted, and when ready for the new porcelain a little of the powder mixed very thin is placed in the hole for the post and the crown forced into position. This crown may be completed in one baking.

Mounting Detachable Post Crowns.

Fig. 3 shows a method of mounting a detachable post crown, the technique of which is as follows: Prepare the root with facer to the desired shape, as shown at Fig. 3 a, and with a C. D. Co. reamer enlarge the pulp canal so that it will accommodate a Davis crown pin in its strongest portion. With a large inverted cone bur, or counter bore, make a countersink to accommodate the flange so that it will be flush with the end of the root (Fig. 3 a). This will give added stability to the pin.

For a foundation take a disk of platinum 40 gauge, and with a plate punch make a hole which may be enlarged with a tapered mandrel. Adjust the disk to the post to make sure that the hole is sufficiently large to allow room for a thin platinum tube. Now, take the mandrel and wind a strip of inlay foil upon it and form a tube. Without removing tube from mandrel pass it through the hole in the disk, made by the same instrument, until it fits the opening perfectly. Gently remove the mandrel and solder the tube to the disk with a small scrap of pure gold. With sharp scissors remove the part of the tube remaining upon the root side of the disk (Fig. 3 b), and then it is ready for use.

Take the base thus prepared (Fig. 3 c) and adjust it to the end of the root carefully, malleting and swaging it to every part of it, and trimming to conform to the periphery, allowing it to extend a little over the borders so that the edge may be turned up if possible. Having done this, take the crown selected for the case and grind it mesio-distally, as in Fig. 3 d, and adjust to the base so that the cervical portion will rest upon the platinum.

Owing to the tendency of the platinum to be drawn out of shape by the porcelain, it is always advisable, when possible, to have the crown rest upon the cap or cope, both labially and lingually. However, if in adjusting the crown this is found to be difficult, let the labial border receive the attention.

For anterior teeth Davis crowns are best adapted to all cases, but for bicuspids, diatoric teeth are preferable. These teeth supply bodies of porcelain (without platinum pins) of the approximate size, shape and

color of the tooth we wish to restore. I am glad to know that it is now possible for the busy crown workers to obtain pinless facings in quantities. In assembling the parts of this crown, all that is necessary is to force the crown down over the tube, and the closeness of the fit will enable one to remove them as one piece, after which the adding of the porcelain is a simple matter.

In more difficult cases it is sometimes necessary to change the shape of the crown; it may be too wide, or the hole for the pin may not be located in a suitable position, thus preventing proper adjustment. When these difficulties are met, matters are somewhat facilitated by removing

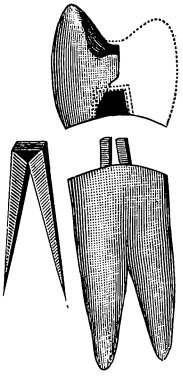


FIG. 4.

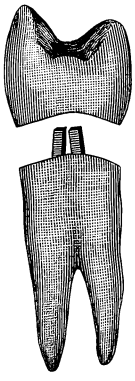


FIG. 5.

with excising forceps part of the lingual portion, and then with a seven-eighth knife edge stone open into and enlarge the opening for the post (Fig. 3 e). By carefully grinding this opening so that it firmly grasps the tube, and also rests securely upon the platinum base, the parts may be removed, all saliva and mucus washed from them, and then reassembled without fear of their being misplaced.

In assembling the parts they may be held in the fingers, or by pliers, and a small quantity of porcelain added for the purpose of tacking them together. Work is then placed in the furnace and a union made, after which the crown may be adjusted for the final fitting and shaping.

In producing a crown which calls for extensive shaping, the pinless facing, or the ordinary facing, offers a greater variety of molds and colors, and may be used just as easily as the Davis crowns.

Bicuspid Crowns.

Your attention is now called to Figs. 4 and 5, which explain themselves. We have two small posts set in this root, which may be of platinoid, or

iridio-platinum, and may be either square or round, or may be made in one piece from three-cornered iridio-platinum wire bent to fit each root in such a manner that a flat surface is presented bucco-lingually, which will form a dove-tail space between the parts extending from the root. The technique pertaining to the construction of the bicuspid crown is identical with that pertaining to the crowns already described, except that a mandrel shaped purposely for enlarging the hole in the platinum disk is used instead of a round one. It is often more satisfactory to work from a model than to do the work directly upon the root. More shapely crowns may be produced by working upon a model, as we are able to obtain a more perfect occlusion.

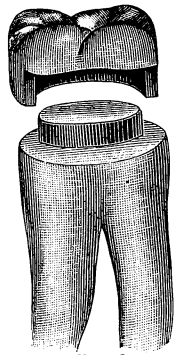


FIG. 6.

Biscuited Teeth for Molar Crowns.

The use of biscuited teeth in the construction of molar crowns facilitates the work in a marked degree. These teeth may be obtained by special order at a moderate price, and medium shades and colors, such as meet the general demand, may be kept on hand.

In the use of these teeth we obtain better forms than the average dentist is able to make for himself, and, besides, the porcelain is molded under pressure and produces a finer finish. The points wherein they facilitate matters are that they are easily shaped before fusing, and that when fused they may be adjusted to foundations prepared for them, and the space filled in as in other crowns. Fig. 6 shows one of these biscuited teeth, which you will see is nothing more than a veneer, and I trust explains itself.

The Tube Crown.

The tube crown is so closely related to the all-porcelain hood or jacket crown, that much of the technique of one may be used for the other. For

beautiful adaptation, the overlap facing and the entire porcelain jacket are in a class by themselves, and in these days of a growing demand for oral prophylaxis, we must study to produce crowns which will not in any way irritate the mucous membrane surrounding them, nor afford a lodgment for soft deposits of any kind. With these ideas in mind I wish to present for your careful inspection and criticism a modification of a jacket crown for pulpless teeth. This crown may or may not have the post baked into it, and the use of the post is simply for adding strength to the root.

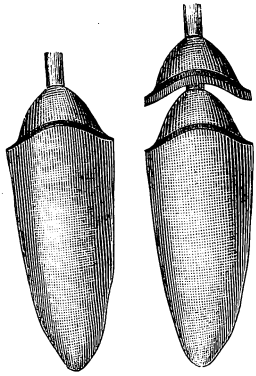


FIG. 7.

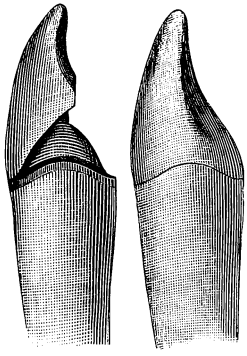


FIG. 8.

The technique is as follows: Instead of cutting the tooth off to the gum line, prepare it in a manner that will leave a stub, over which a platinum tube may be fitted. With burs and stones establish a distinct shoulder (Fig. 7). Enlarge root canal and fit an iridio-platinum post, allowing it to extend a short distance outside the stub. Now prepare a tube of platinum, and be sure that it passes under the gum and extends far enough over the shoulder, so that in burnishing it will not be drawn away from the edge of the shoulder; burnish the platinum to an accurate fit, enveloping both post and root.

If it seems best to have the post baked into the crown, the platinum and post are grasped firmly with pliers and removed from the root and soldered with a small piece of pure gold. The cap and post are then replaced and given a final burnishing; especial care being given to the outline of the shoulder. A Davis crown or a facing may be fitted to the cap and post, and finished in the same manner as a jacket crown (Fig. 8).

We now have a post crown, not unlike a Logan crown, yet with all the beautiful adjustment and finish of a jacket crown. I feel justified

in claiming for it the highest place in the list of crowns for pulpless teeth. Compare it with the ordinary results obtained with any of the commercial crowns and render your own verdict.

Moldable Porcelain. Dr. C. H. Land has introduced a moldable porcelain that is a great aid in porcelain crown work. This material is made by a process which combines any of the commercial porcelains with gum chickle. This gum gives the plastic consistency and will burn out, leaving the work as formed, and many beautiful, as well as practical, things may be made with it.

In assembling parts of crowns, this moldable material is a great help; as being practically impervious it may be used in the mouth without danger of injury from the saliva. After considerable use I am glad to report good results with it.

In adjusting a facing to a tube or post by making a jelly mass (which is obtained by mixing it with chloroform), and placing it upon the back of the facing, and then pressing the facing into position, the mass soon hardens and will hold the facing and foundation together, allowing their removal as a whole. When this is accomplished the crown is laid face down upon a slab, upon which a little bed of powdered silex has been formed. It is then placed near the door of the furnace and the gum burned out, after which it is placed in the muffle and given a high biscuit. The facing will not be injured at all in this way, and the parts are less liable to change their position. The work is then completed with a plain porcelain body.

A Plea for More Scientific Forms of Artificial Teeth.

Editor ITEMS OF INTEREST.

Dear Sir—My attention has been called to the controversy going on in regard to an improvement in porcelain tooth forms, and I have been asked to comment on the same.

If those engaged in the manufacture of porcelain teeth would follow more closely the architectural forms given to man by the Maker of the natural dental mechanism, in preference to attempting to create forms of their own, very much of the "weeping, wailing and gnashing of teeth" now so common here, would be relegated to the hereafter, where it is said to belong.

Let them observe the close relationship which exists between the human temperaments and tooth forms, the difference in the excursions of the mandible as exemplified in the two extreme types, nervous and lymphatic, the former exhibiting a locked or fixed occlusion of the teeth, and the latter an occlusion loose and wandering.

I do not entirely agree with the suggestion that molds be made in accordance with the Bonwill idea of occlusion and articulation, for while Bonwill's ideas in this regard were far in advance of those previous to his time, they were incorrect, in that the incisive edges and occlusal surfaces of the teeth were treated by grinding in the same way in all cases, which would mean that the occlusal planes must be alike in all instances, and that the movements of the mandible are without variation.

That there is room for improvement in porcelain tooth forms there is little doubt, and it is hoped that the recent agitation in this direction will be recognized by the manufacturers, and the necessary changes made. Like Dr. Haskell, I say cut down the number of molds at least 50 per cent.; this alone will do much toward better results.

Very truly yours,

I. N. BROOMELL,

Medico-Chirurgical College of Philadelphia.

Editor ITEMS OF INTEREST.

Dear Sir—I am much gratified with the awakening in regard to the improper forms of our present-day porcelain teeth.

Along with other teachers of dental prosthesis it has been a mortification to me to have to teach, year by year, how to adapt improperly shaped teeth so as to form a proper and serviceable denture.

Usually the six anterior teeth have reasonably good forms and are of a proper size, but the bicuspids and molars are always faulty in both of these respects. These teeth should have greater width both mesio-distally and linguo-buccally, which would, of course, give them greater occlusal area. This increase in size, however, must not be carried too far, else we would have too limited space for the tongue, or too great a portion of the crown carried out beyond the fulcrum (center of ridge) with a tendency to cause tipping of the plate.

Several of your correspondents recommend more prominent cusps and deeper sulci. This I consider an error, for an unstable denture can

not resist the greater lateral strain of long cusps gliding along long cusps. With the natural teeth this is all right, for they can not be moved out of position, but artificial ones need less pronounced prominence and depressions so as to avoid dislodgment.

One or two writers deplore the necessity of removing the glaze in grinding. This should in all cases be removed to prevent the slipping of food in mastication. A ground surface will prove twice as efficient as a glazed one.

It is important to copy nature to a certain extent, but we must not imitate too closely when the conditions are so different.

If some of our largest tooth manufacturers would submit certain of their best models for criticism to prosthetists of large experience and known artistic taste, then modify and submit again, we would at least be making a beginning toward obtaining more natural and more serviceable tooth forms.

I hope the agitation for improvement may continue until satisfactory results are obtained.

Very truly yours,

S. H. GUILFORD.

Philadelphia Dental College.

Editor ITEMS OF INTEREST.

Dear Sir—In reply to your request of March 11, will say that for several years I have been interested in the improvement of artificial teeth molds, and have gone into the matter quite extensively with one of the largest manufacturing concerns, but up to the present with no apparent result. While some improvement is needed in the "fronts," it is the "backs" that are the poorest. My point of view is from that of an exponent of anatomical articulation, which demands bicuspids and molars with large occlusal surfaces and with cusps sharp and fissures deep, so that the one will fit into the other. The upper and lower teeth should be so molded that there will be a normal occlusion, *even* to the *contact* of a *particular palatal cusp* with a *particular fissure* of the opposing teeth. It is impossible to obtain this result with any mold now on the market. The gravest fault with the "fronts" is that in sets of twenty-eight upper and lower, one set of lower is matched with perhaps a dozen upper ones, with a marked discrepancy in the size of the "fronts," which frequently are made too wide for the uppers, in an effort to give an "edge to edge" bite. The manufacturers say to the dentist, "You ask for natural molds.

Where are we to get them?" "We have natural molds now." Where should natural molds be found but in nature? Man has tried his hand at making molds which he thought were an improvement on nature, but now we are just beginning to realize how great is his failure.

Nature furnishes plenty of models in normally arranged teeth, teeth with an overbite; with fairly long cusps and deep fissures; with cusp surfaces flat, not rounded, so that the cusp actually interlocks with its opposite; with teeth so molded that they occlude when arranged in the compensating curve; teeth with sharp buccal cusps on the upper and sharp lingual cusps on the lower molars; teeth that can be slanted to line up with the upper and lower ridges, and also with the direction of force during mastication. This is what we mean by natural *molds,* copies of normal nature, not what some man calls natural.

To produce these natural molds ought to be a simple problem to the manufacturer, once he is willing to undertake it; and he ought to be as willing to furnish new molds (when there is admittedly a demand, even if this demand does come from a few of the better men in the profession) as he is to get out some new appliance, the value of which is as an article which will be a good seller. If there could be made two molds of "backs" in the various shades, a medium and large size, with medium "bite" and "ridge lap"; teeth with deep fissures and sharp, natural shaped cusps, which were exact copies of nature, and which were *made to occlude,* it would be possible to give our patients teeth which could be arranged for anatomical articulation in an anatomical articulator, with less expenditure of time and trouble, and with a hundredfold better results than can now be obtained. If in addition manufacturers would make a few more lower "front" molds, dentists would think the millennium were surely coming. Teeth of persons not over twenty years of age should be used as models; because after this age the sharp cusps, which are so necessary to easy mastication, begin to wear down; and while the middle aged person should be provided with anterior teeth, the shape and edges of which show the effects of wear, the bicuspids and molars should have sharp cusps, so that mastication can be performed as easily as possible. Since receiving your letter I have been advised by the local manager of the Consolidated Manufacturing Company that new molds will be made, and he has asked me to furnish a few. This pleases me very much, as I had given up all hope of obtaining suitable molds from any other source.

Very truly yours,

HAROLD DEW. CROSS.

Harvard Dental School.

Editor ITEMS OF INTEREST.

Dear Sir—I reply to your communication as follows: I would suggest a deeper shade of cuspids; somewhat more constriction of the necks of the bicuspids and molars; also of the cuspids; somewhat more bulk of crowns of the bicuspids and molars above the necks; a greater inclination on the palatal surfaces (also lingual) of the bicuspids and molars from the gingival to the occlusal surface, in other words, a receding toward the occlusal surface; also a greater inclination of the occlusal surface of bicuspids and molar teeth from the mesial to the distal surface. In the White Dental Manufacturing Co. teeth molds, Nos. 177 and 178, the shape is very good, with the exception of being a little too convex on the labial surfaces of the superior incisors.

What I have specified as improvements, in my opinion, approach more nearly to nature, when nature has performed her part well; or, in other words, to the best natural teeth.

Yours truly,

F. J. S. GORGAS.

University of Maryland, Dental Department.

Editor ITEMS OF INTEREST.

Dear Sir—Complying with your request of the 4th asking me to express my views on the unsatisfactory forms of artificial teeth, permit me to quote from an article on "The Selection of Artificial Teeth for Full Dentures," written by me in June, 1902, and published in the *Dental* Review in October of the same year:

"The selection of artificial teeth is a task that is not always easy, and one that often perplexes many of us. The numerous varieties of shapes, sizes and colors of artificial teeth seem to complicate matters rather than simplify them. If the manufacturers would spend more time perfecting some of their molds instead of having so many new ones constructed they would serve the profession better.

"While taking measurements of a number of sets of full upper and lower plain teeth, the following observations were made. The uppers: The sizes of the incisors and cuspids are not always in proper relation. Many sets have wide centrals with narrow laterals and cuspids, while others have narrow centrals with wide laterals and cuspids. Some have the cuspids as wide as the centrals, while others have laterals as wide as

the cuspids. In almost every set measured the bicuspids were too narrow mesio-distally. Some have second bicuspids from one-half to one and one-half millimeters wider than the first bicuspids. The upper molars are from one to three millimeters too narrow bucco-lingually. This lack of masticating surface is one of the principal criticisms of artificial teeth. The lowers: Many of the lower sets have centrals and laterals of the same width, which is not a serious objection. The cuspids are from one-half to one millimeter too narrow mesio-distally. The lower bicuspids are usually too large for the uppers, and the lower molars, like the uppers, are too narrow bucco-lingually."

I wish to thank Dr. Williams for his persistent efforts to create an interest in the profession on this subject and I hope some good may come from his efforts. I am unable, at this time, to suggest a good course to pursue in order to establish satisfactory molds. I shall read the opinions of others with interest and you may hear from me later.

J. Q. Byram.

Indiana Dental College.

Editor Items of Interest.

Dear Sir—Yours of the 16th inst is to hand relative to artificial tooth forms. I have been reading with interest the letters in your journal on the subject, but I can not take from orthodontia time sufficient to prepare models for manufacturers. I would refer those interested in the subject to my three papers in the *Cosmos,* which appeared eleven or twelve years ago. As I see the matter, what is needed is a mold for each of the four basal temperaments, each in three sizes, and each size in as many shades, and then the same variety of shades and sizes in about six mixed types. A good way to get these forms would be to carve them from plaster casts made from plaster impressions of natural teeth, bearing in mind, however, one point which I must emphasize, that in order to have the balancing articulation in the lateral excursions of the mandible, which does not exist with the natural teeth, it would be necessary to modify the plaster casts. This would be done by deepening the mesio-distal sulci in both the upper and the lower molars and then shallowing the sulcus again by shortening the buccal cusps above and the lingual cusps below, so that in the end there would be but two differences in the occlusal faces of the molars secured without altering the inclination of the lingual or buccal surfaces; the first being the greater prominence of the lingual cusps over the buccal in the upper, and the buccal

over the lingual in the lower; the second difference consisting in a slight lessening of the mesio-distal diameter of the upper molars, so that the cusps will not be thrown out of occlusion when the compensating curve is increased, as it must be greater in artificial teeth than in natural teeth in order to balance in incising, as natural teeth do not. The point is that the upper molars will be arranged on an arc of a smaller circle than the lower ones, or than would be natural in vital teeth.

Fraternally yours,

WM. ERNEST WALKER.

Editor ITEMS OF INTEREST.

Dear Sir—I have read with great interest the articles in ITEMS OF INTEREST regarding new molds for artificial teeth, and I am heartily in favor of a more natural artificial tooth.

The pins in the artificial teeth we have to-day are set entirely too close to the occlusal surface of posterior teeth, thereby losing the lingual contour, and all posterior teeth have not enough grinding surface: cusps which are practically of no value in mastication.

In some of the anterior teeth the pins are set so close to the incisal edge as to make them utterly useless.

Very few, if any, of the full upper and lower sets that we can purchase to-day are made in proportion and proper relation to each other.

If at any time you learn of a more "natural" artificial tooth being placed on the market, I would like to know of it.

Fraternally,

S. E. HAYS.

Uvalde, Texas.

The Influence of Nasal Obstruction and Mouth Breathing Upon the Development of the Face, Palate, Teeth and Chest.

By Henry J. Hartz, M.D., Detroit, Mich.

Read before the American Society of Orthodontists.

The ill effects of nasal obstruction and mouth breathing appear to have been well recognized by the ancients. In the seventh book of "Epidemics" Hippocrates describes the clinical symptoms of nasal diseases, mentioning the high-arched palate, the irregular teeth, the headaches and the ear discharge; also the defective chest development. Even among the aboriginal tribes obstruction to breathing was noticed and treated. An Indian maxim reads that "the man breathing through the mouth is a weak man, the man breathing through the nose a strong man;" while to-day the mothers of the Sandwich Island tribe clear the infant's nose from obstructing secretions by suction with their mouths.

Mouth Breathing a Cause of Nasal Obstruction.

Dr. Mayers, of Copenhagen, first disclosed the local and remote significance of nasal obstruction. He revealed that the enlarged lymphoid tissue in the nasopharynx, the adenoids, was one of the causes. Since that time, which was in the year 1873, different observers have found other causes of nasal stoppage; such as septal deviation, spurs and enlarged turbinate bodies; also the open bite, the result of deformed jaws and imperfect apposition of teeth, especially the protruding teeth over which the lips can not close perfectly, a condition which often

renders an open nasal channel useless. To-day we estimate that about 70 per cent. of the children are more or less mouth breathers. Many of them breathe normally through the nose, while the body is erect during the day, but when in a recumbent position, the blood extravasates into the soft tissue of the nose, and induces obstruction of the lumen. As a rule, acute inflammation of the child's nose remains untreated, becomes chronic, and the turbinated bodies pass through the stage of hypertrophy and hyperplasia, which soon extends to the rear of the nose, and involves the nasopharynx, provoking the formation of adenoid vegetation. The substitution of oral respiration for the nasal fails to give the proper degree of moisture and heat to the inspired air, and, moreover, admits into the mouth countless germs and irritating dust, which would normally find lodgment in the vestibule of the nose. Mouth breathing leads to dryness of the mucous membranes, which predisposes to catarrhal states of the mouth and upper air tract, more especially in the region of the nasopharynx; the protecting layers of the epithelium are disintegrated, and such membranes invite infection, while frequent attacks of inflammation provoke an increase in the size of the tonsils.

Phagocytosis, which is continually in progress within the tonsils in catarrhal conditions, produces hypertrophy; and unless corrected, the catarrhal process may invade the accessory sinuses, and sooner or later spread to contiguous parts, such as the ear and the lower air passages. The secretions are usually swallowed, because the child has never had control over the muscles which perform the act of expectoration; hence, this mucus, frequently mixed with disease-producing bacteria, finds its way into the gastro-intestinal tract, producing digestive disorders of toxic origin. The difficult task of adapting himself to mouth breathing is somewhat modified during the day, when the child consciously keeps the mouth open to let in sufficient air. In sleep, however, the muscles involuntarily close the mouth, rendering respiration labored and well-nigh impossible. The child has disturbing dreams, is very restless, and often awakens in perspiration.

Evil Results of Mouth Breathing.

For successful oral respiration two changes are necessary: first, the depressing muscles of the lower jaw must be in action to open the mouth; and secondly, the tongue must undergo a change of its position from the roof of the mouth, its normal position, to the floor of the mouth. Much of the restlessness and disturbance of the nutrition of the child is due to the period of adaptation to breathe through the mouth. Add to this the insufficient oxygenation and the digestive disturbances, which he can not escape, and we have sufficient cause for considering the ill effects of nasal stenosis and mouth

breathing, as factors in retarding the growth of the entire body, both local and constitutional. With the changed position of the tongue in mouth breathing, the force which the tongue exerts upon the hard palate on its normal growth is lost, resulting, probably, in a narrowed arch instead of the normal curve.

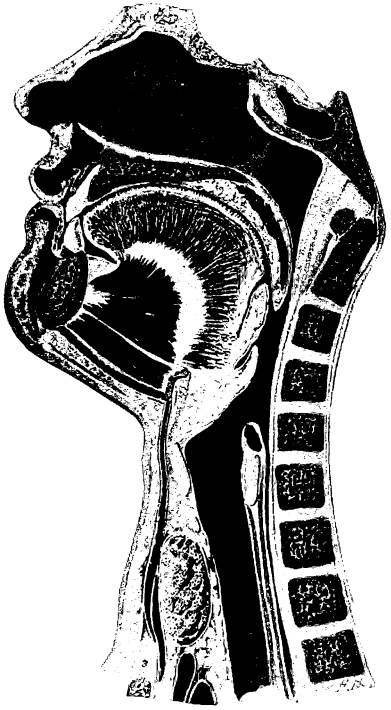


FIG. 1.

During nasal respiration the strong fan-shaped muscle of the tongue is in its normal position, pushing forward and sideways against the hard palate, shaping its growth (Fig. 1). Its position is reversed during mouth breathing, when it drops to the floor of the mouth, and its influence upon the hard palate is lost.

With the mouth closed the tongue rests normally against the upper teeth, and presses sideways and forward on the hard palate. The tendency of this force is to make the palate conform to the shape of the tongue, especially during swallowing and speaking. Thus, mouth breathing, aside from inviting infection, removes the force of the tongue, which is constantly aiding in the normal growth of the hard palate.

Etiology of Deformities.

The etiology of deformities of the face, palate and teeth is still a subject of debate. Some authorities believe that an obscure condition of malnutrition plays an important role; likewise that heredity determines the structure of face, palate, teeth and chest, rather than the post natal influences of nasal stenosis, and oral respiration. In the en-

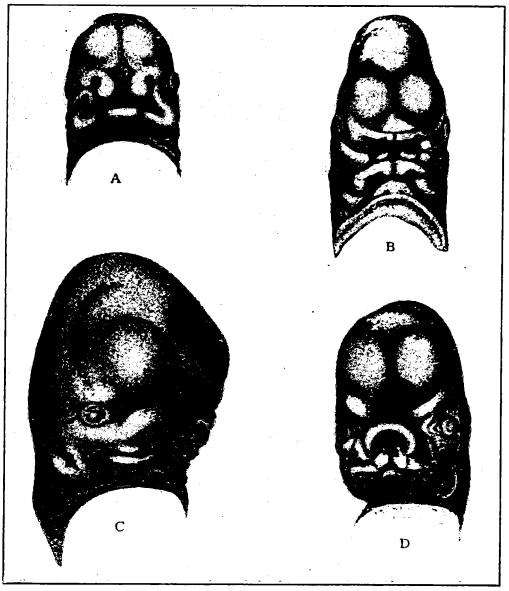


FIG. 2.

A. Embryo of about twenty-nine days. The naso-frontal plate differentiating into processes of first visceral arch are extending. B. Embryo of about thirty-four days; the globular, lateral, frontal and maxillary processes are in apposition; the primitive opening is now better defined. C. Embryo of about the eighth week; immediate boundaries of mouth are more definite and the nasal orifices are partly formed, the external ear appearing. D. Embryo at end of second month.

deavor to determine some of the causes of maldevelopment in the child's face, it may be profitable to study its normal development, and the forces that might retard growth, and also to take into consideration its embryonic development; for, at this period, it is likewise exposed, and frequently the foundation is laid for future deformities.

During intra-uterine life the factors that may imperil physiological growth are the infectious diseases of the parents, malnutrition, shock or

injuries. For instance, it is recognized that a deficient amount of amniotic fluid exposes the embryo to injuries and undue pressure, owing to the fact that the elastic support of the normal quantity of the fluid is lost. Furthermore, the injuries sustained during difficult labor must be taken into account; likewise the trauma of instruments in the hands of the accoucher. Prognathism is sometimes produced in breech presentations by the hands of the obstetrician while making traction on the lower jaw of the child, causing displacement of the temporo-mandibular joint. It is held that a cleft palate may be caused by injury of the embryo, the mandible pressing into the maxilla, thus preventing union of the palate suture.

The changes in the embryonic nose are important as an essential to the growth of the face. The first indication of the formation of the nose in the embryo may be seen at the second month when a groove makes its appearance on the frontal protuberance, then two projections form on each side, termed nasal processes, the external pair developing the outer walls of the nose, the internal forming the septum (Fig. 2).

The mandibular, or first pharyngeal, arch divides into two parts, the superior joining with the opposite side to create the upper jaw, while the union of the inferior maxillary portions go to form the lower jaw, and the nasal processes grow downward, at the tenth week reaching the floor of the nose, which has been formed by the union of the two superior portions of the mandibular arch. The septum of the embryo is formed of two parts, which coalesce at the second month, and which at this time consist of cartilage. Beginning at the third month of intrauterine life, ossification begins on both sides of the septum, which now unites to form the vomer. Into the groove of the vomer the perpendicular plate of the ethmoid is fitted in its anterior aspect, the rostrum of the sphenoid bone joins above and the nasal crest of the superior maxillary and the palate bones below. Thus the vomer is securely locked in its place by surrounding bones. Septal deformities and spurs have been found to exist as early as the sixth month in the embryo. The ethmoid plate does not begin to ossify until the sixth month of infancy. Starting from the body of the ethmoid it reaches the vomer in the third year, and the process is completed about the sixth year. Premature ossification of sutures of the facial bones results in lack of growth, and the nasal space remains abnormally small, especially when affecting the interpalate, intermaxillary and the vomerine suture. An obscure form of malnutrition, such as rickets, is held to be the cause. In infancy the bridge of the nose is low and undeveloped, and the openings are on a plane with the face, the apex being tipped upward; but as the septum develops, the bridge is elevated and the openings are directed downward,

arresting in this manner the development of the perpendicular plate of the ethmoid bone, causing the deformity known as pug nose. Unlike other bones, those of the face are not developed from cartilage, but are produced within sheets of connective tissue, and are, therefore, spoken of as arising by intra-membranous development.

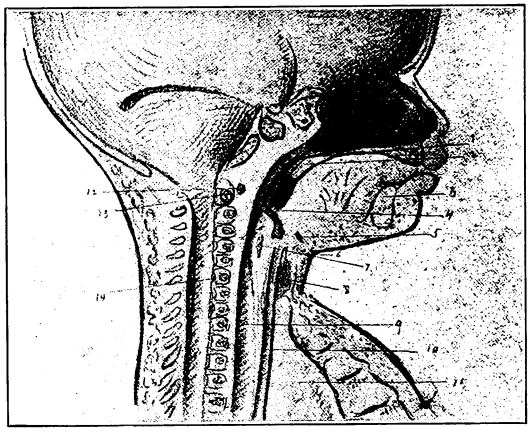


FIG. 3.

Section of head of a newly born infant, showing the predominance of the ethmoidal nasal space over the maxillary. The face, while helping to form the orbit and nasal cavity, is essentially for the jaws and teeth. The greatest change is the downward growth of the face. In the infant the face is to the cranium as one to eight; at two years, as one to six; at five years, as one to four; at ten years, as one to three; and in the adult, as one to two.

Embryologists have demonstrated that the nasal passages of the child differ in relative size and form from those of the adult.

For while the ethmoidal portion of the nasal space is twice as high as that of the maxillary portion in the child at birth, in the adult they are of equal height. Somewhere near the eighth year the nasal space assumes relative adult proportions, and the maxillary portion equals in height that of the ethmoidal portion.

And with this growth and the descent of the hard palate the nostrils develop slowly. Thus during this period of seven years the nasal organ of the child is under stress; normal development is taking place, while respiration is confined chiefly to the upper ethmodial portion, the lower

portion being very narrow and the inferior turbinated bone touching the floor of the nose. In this manner we may account for the dangers of acute inflammation of the nares in the infant, which may become distressing and dangerous on account of interference with proper feeding and oxygenation.

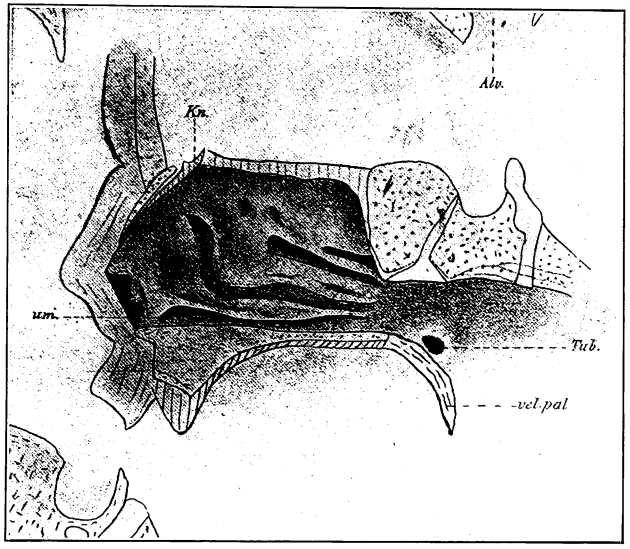


FIG. 4.

Section of a child's nasal space at the age of three years, having developed so that the maxillary portion represents one-third and the ethmoidal portion two-thirds of the nasal cavity. The mouth of the eustachian tube is on an even plane with the hard palate.

Development of the Nares.

A notable development of the nares takes place with the eruption of the milk teeth, when the superior maxillary bone, which is very vascular, increases in its dimensions, and gives rise to the formation of the maxillary sinus. At birth the body of the superior maxillary bone consists almost entirely of the alveolar process, the sockets of the teeth being in contact with the orbital plate. However, the growth of the face takes place simultaneously with that of the maxilla by the formation of spongy bone between the alveolar process and the orbital plate of the maxilla, and in this way the alveolar process, along with the teeth, become separated from the orbital plate. Coincident with the in-

crease in the cancelous tissue upon the facial and dentary aspects of the bone, a process of absorption apparently takes place upon its nasal and orbital surfaces, which causes the formation of the sinus and the broadening of the nasal chambers. This simultaneous process of growth and absorption continues until the eruption of the wisdom teeth at about the twenty-fifth year of life, when the antrum reaches its complete and adult form.

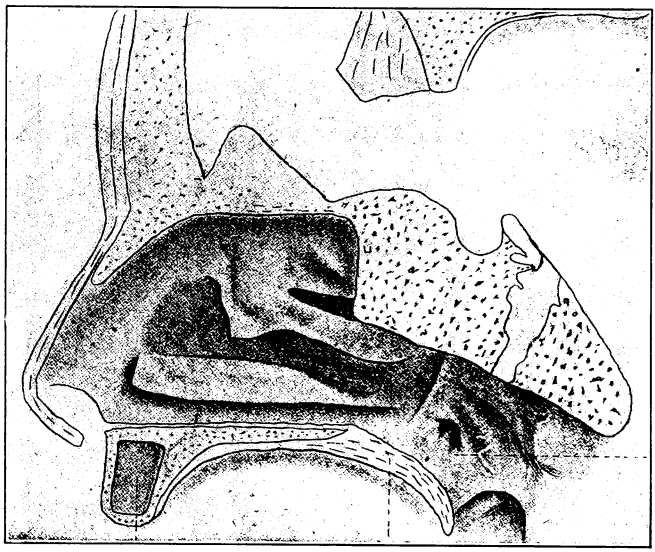


FIG. 5.

Section of child's nasal space at the age of eight years, showing that the nasal chamber has developed so that the maxillary part equals that of the ethmoidal. The palate has grown downward and the eustachian tube is above the plane of the palate.

We have said the nasal spaces increase in size by the downward growth of the hard palate. In proof of this it may be seen that in the embryo the hard palate is above the level of the mouths of the eustachian tubes, while in the newborn it lies on an even plane, and later, about the eighth year, considerably below it. The nasal space is lengthened by the growth of the palate in the antero-posterior direction, and by the development of the alveolar process, which affords space for three molar teeth, and which has its beginning near the seventh year, to be completed at the time of full dentition. This development of the nasal

spaces in the antero-posterior direction pushes the maxillary bones forward and causes the orthognathous face of the child to assume the more prognathous form.

Development of Head and Face.

The head and the face grow more rapidly in two periods. The first from birth to the eighth year. The second period begins at puberty, or at the fifteenth year, when the head and face develop in all directions alike, and are completed in the female about the nineteenth year, and in the male at about the age of twenty-one. During the in-intervening period, from the seventh to the fifteenth year, much less growth takes place. The development of the child's face may be divided into three stages. During the first year the examination of the head and face is general, but the face gains distinctly on the cranium, more especially in the lower nasal cavity. The second stage is ushered in at the second year, to continue to the fifth year, when the face grows more in breadth. From the fifth to the seventh year the face grows more in length, while the nose develops chiefly in the lower region. The hard palate, forming the floor of the nose, descends to increase the dimensions of the space above. At birth the hard palate, if prolonged back, would strike near the junction of the basilar process and sphenoid. At the age of three it has grown downward to strike near the middle of the basilar process, and at the age of six it may be seen on the plane with the edge of the foramen magnum, which is nearly the relationship of the adult palate. The choanae likewise exhibit changes indicative of palate descent. At birth the height of their cavities is about six mm., and the breadth a little more. At the first year it has doubled, at the second year its height has increased more rapidly and has changed from a circular to an oblong channel; at the seventh year its perpendicular axis is twice the length of the horizontal, and has assumed at this early time the relative adult form.

Nasal Obstruction.

From the foregoing we conclude that at about the eighth year the structures have practically assumed a permanent form, and it may be said that up to this time the child has been predisposed to nasal obstruction, due to the process of physiological growth, and most especially at the period of eruption of the deciduous teeth and first permanent teeth. At about the fifth year the third tonsil is beginning to assume larger proportions and threatens to close entirely the narrow nasal lumen. Those children having a spacious nasopharynx, such as those descended from the brachycephalic type, with platyrhinnic noses, and the mesocephalic type, are less liable to nasal stenosis than those who have ancestors of the dolychocephalic head, with the laptorhinnic

noses. In fact, the latter class always suffer more or less, and are the most frequent visitors to the rhinologist and the orthodontist. They have inherited a type of facial structure called the leptoproscopic, which is a narrow and long face, with high and thin nose, small orbital cavities and accessory sinuses. small nasal chambers, and a high-arched palate and limited alveolar processes, in which the normal teeth can not find proper alignment. The nasopharynx appears small, and its dome, like that of the hard palate, is Gothic shape, its space is readily encroached upon by the pharyngeal tonsil. Thus we find a type of face that we are tempted to say was produced by nasal stenosis and mouth breathing. The fact is, however, that many of these have never had nasal obstruction, although from their appearance it would be the natural inference. Such patients are very prone to nasal stoppage by inflammation, and the smallest portion of the normal pharyngeal tonsil may produce complete occlusion. They have inherited a deficiently developed facial structure, predisposed to catarrhal affections, and are a type that must not be classed as having resulted from nasal obstruction, but rather as a type developed by a racial characteristic from ancestors who may have suffered for centuries from the effect of nasal stenosis and oral respiration. It may be assumed that through centuries of disuse of the nose, and the baneful effect of mouth breathing, a type of this character has gradually evolved. It is painfully true that many of this type of head and face, which is associated with a frail, bony frame and chest, become subjects of tuberculosis later in life.

Recent autopsy reports that many subjects dying of tuberculosis have suffered from inflammation of the nasal membranes, and that the majority of them had the narrow facial outline, with small nostrils and imperfect masticating mechanism. It is rare that the opposite type become tuberculous, such as are endowed with a strong and broad face, perfect teeth, imbedded in a rounded and strong alveolar process; in short, a good masticating mechanism. This type of face is usually associated with a strong osseous and muscular system and well-developed functions of digestion and assimilation. They more often have a brachycephalic head, with wide cheek bones and broad noses. On account of their spacious nasopharynx the lymphoid tissue never produces the same degree of stenosis as in the narrow face. Frequently the so-called adenoids assume large proportions in these subjects, but remain unnoticed because they have plenty of space around them. The alveolar arch has the normal circumference and the teeth arrange themselves in proper alignment, so that the function of the jaw is in full use; in consequence the muscles of mastication supply by their proper activity the

requisite amount of lymph and blood to the parts for their development. These patients, when attacked with nasal stenosis, suffer less from lack of oxygen and malnutrition, and their deciduous teeth remain intact their full time. They do not suffer from premature loss of the deciduous teeth through decay, and escape the deforming effect upon the alveolar arch, which the premature loss of the deciduous teeth produce.

Influences of Heredity.

The opinion is general among medical men that heredity influences the condition which induces maldevelopment. In our country a mixture of races is in progress such as has never before been witnessed. The old Aryan race, which divided and lived exclusively in different parts of Europe for many centuries, is uniting in marriage on this continent, and the result is that asymmetry is the rule rather than the exception. According to Broco intermarriage of the long and round heads often results in deformities in the offspring. The ears and nose strongly exhibit the influence of heredity. The long or dolychocephalic head has a high and long nose, while the round-headed individual is endowed with a broad and low nose. Should a child, therefore, inherit the nose from one parent and the jaws from the other, there would result an asymmetry of the face. Thus realizing that the people of the United States constitute a composite race, we may account for the irregular structure of the face, nose and teeth of our neighbors. The purer a race is, the more regular and distinctive are its features. The prevalency of deviated septums and other anomalies that give rise to nasal stenosis may be ascribed to structural defects, due to the evolutionary changes that are caused by the intermarriage of different races in our country.

The fact that a high-arched palate with irregular teeth is usually found co-existing with nasal obstruction, has given rise to the theory that the interference with nasal respiration is the first exciting cause of this condition; and it may be consistently argued that when the function of the nose is interrupted the friction of the air currents by inhalation and exhalation can not exert the requisite stimulation to growth, and the circulation of nutrient material is lessened, so that diminished nutrition is the result. The non-use of any organ has always the consequence of either that of non-development or atrophy, and the degree of disuse of any organ determines the degree of arrested development.

Influence of Disease of Nasal Passages.

The maxilla is in no small way dependent upon the nasal function for its growth. The osteogenetic centers and resorptive process of the vascular upper maxilla will be interfered with by disuse of the nasal organs. The hard palate and alveolar arch,

being limited to the growth of the superior maxillary bone, will remain too small for the proper eruption of the teeth, which remain the same in size and number. An imperfect masticating apparatus is inevitably the result, because the teeth can not come in proper apposition in an undersized alveolar arch. In a general way that palate may be considered normal when mouth breathing can be excluded, where no deviated septum exists, and when the individual has not suffered from malnutrition or rickets. A high-arched palate in the long, narrow face is a normal attribute. An abnormally low palate was found by Professor Swain, of Yale, in skulls of the Flathead Indians. This tribe of Indians have a custom of binding a board on the heads of their children with a view of flattening their heads. The effect upon the hard palate was marked, the index of its height was 33, much less than the height of the round heads, which is 46, and about half the height of the long head, which is about 60. By this observation it is revealed that the mechanical force of binding the head was transmitted through the septum, and affected the position and form of the hard palate. If it can be pushed down by such intervention it is pertinent to inquire into the forces that retard its descent. As already stated, if the nose is obstructed the stimulating air currents can not exert the proper functions upon the organ, inflammatory swellings interfere with nutrition, and the proper development is interfered with on the theory of disuse. Nasal obstruction, inherited or acquired, and its inevitable results, mouth breathing and malnutrition with deformation of the facial structure, have given rise to a symptom complex, variously termed adenoid face or lymphatic diathesis. Its indication differs according to the location of the nasal obstruction, which may be due to anterior or posterior turbinated bodies, septum deviation or spurs or adenoids. According to the degree of obstruction to respiration and malnutrition, the patient may have a vacant and pale face, open mouth, hanging lower jaw, defective and curiously toned voice, restlessness and a tendency to snore in sleep, purulent discharge, diminished hearing capacity, or recurrent headaches, associated often with undeveloped mentality, and frequent gastro-intestinal attacks. In children over eight years the deforming influence is marked by a high-arched and deformed palate, irregular eruptions of the permanent teeth and deficient chest development. It is conceivable that while heredity influences conditions which induce deformities of face, yet from what has been said about normal development, the conclusion may be drawn that it is more the result of interrupted development due to external causes, such as injuries and obstruction by adenoids. The normal growth of the face away from the skull, which is in active progress up to the eighth year, may

be easily retarded by disturbed metabolism, by disuse of the function of the nose, and by the diseases occurring secondary to nasal obstruction and mouth breathing. The consequent faulty apposition of teeth prevents the proper function of mastication, another important cause of retarded growth of the jaws. The associated mental defects in case of nasal obstruction are due to stasis or lymph in the meningeal membranes, which may be ascribed entirely to mechanical causes, for upon removal of the obstructing adenoids, the congested lymph channels disappear, and with it the headaches and mental depression. Early attention to malnutrition, and removal of obstruction when first seen, will favor a normal development, and save the child from the stigma of mental and physical degeneracy. We believe, however, that above designation by evolutionists is unfortunate, because these malformations affect the frame of the face and head, and very remotely, if at all, the brain.

Constitutional Effects of Nasal Stenosis.

The constitutional effects of nasal stenosis and oral respiration is often seen in defective chest development. While it may be possible to obtain sufficient air through the mouth for oxygenation of the blood, yet by this process of breathing the chest muscles are not sufficiently engaged and are always retarded in their growth. The chest is found sunken and flat, and the muscles furnish only sufficient power for shallow respiration. The inspiration and expiration are less full than in the subjects who breathe through the nose. The paleness of the face is partly due to the faulty action of the muscles of the chest, for the ribs are not sufficiently elevated to permit the air to enter, and bring about proper oxygenation. The thoracic mechanism failing, the diaphragm and abdominal muscles are depended upon for aeration, which are insufficient. In consequence certain blood changes take place, such as a diminished number of red corpuscles, increased number of the white, and the production of some abnormal blood cells, known as lymphocytes and macrocytes.

Treatment.

In closing we may briefly mention what treatment is indicated to prevent deformities and arrest of development. It is mainly to remove nasal obstruction and malnutrition. A vicious circle is created by nasal stenosis, compelling oral respiration, resulting in an infection of the air tract, the aural cavity and gastro-intestinal tract, which ends in malnutrition and deformation of the facial structure. Faulty metabolism may likewise initiate the process, to be later followed by nasal stenosis. The masticating mechanism becomes faulty through malocclusion. The respiratory function is lessened, and chest remains undeveloped, and such subjects grow up with little resistance to the infectious diseases, frequently

becoming tuberculous. Treatment consists in removal of obstruction to nasal respiration by hygienic or medicinal treatment, and by surgical methods. Nasal stenosis should be corrected at time of first appearance at any age; the best results are obtained early in life or during the period of development from the first to the sixth year, or before ossification has set in. If the palate fails in descent and teeth erupt irregularly, correction by an orthodontist should be resorted to as early as possible, beginning even with deciduous teeth in order to assist the normal development of face, palate and teeth by mechanical means.

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Discussion.

Dr. Milton T. Watson, Detroit.

Dr. Hartz has discussed for us to-day the development of the internal face, and the influence of nasal and post-nasal obstructions upon the development of these parts. I think we can not fail to be impressed with the thought that the only logical conclusions that can be drawn from the facts he has presented are, that there is, beyond any question, a close relationship between the development of the tissues with

which we have to deal directly, and those of the nasal region; and that the greatest possible influence for good must come from the early correction of malocclusion of the teeth.

The exact relative importance of mouth-breathing, malnutrition, improperly exercised masticating function, and lowered vitality, as primary or secondary factors in the production of malocclusion, is hard to determine; however, they are all factors that must be reckoned with if we attain our greatest usefulness in the correction of oral deformities. If by any chance later investigations should show conclusively that the primary cause of malocclusion is of an hereditary character, we would still be under obligation to consider all the above-named evil influences, for they would still be secondary factors at least. Regardless of whether nasal occlusion is a primary or a secondary factor, it must be apparent that a confirmed mouth-breather can never properly masticate his food because he needs his mouth for breathing purposes, and that failure to perform this function will have a twofold effect, one bearing upon digestion and nutrition, the other upon the lack of development due to disuse of the jaws. The lowered vitality of an individual who is not receiving a normal share of oxygen must also be granted a place of prominence in the list of evil influences, so, to my mind, the active care of these cases will not change greatly, even though the relative importance of various etiological factors may eventually receive more or less prominence than we now accord them.

The first period of active growth of the nasal region is from the first to the seventh or eighth year, so we are told, and this being true, we surely cannot fail to appreciate the fact that the greatest good must come from very early attention, even at three, four or five years of age. This will produce the greatest possible stimulation to a more active nasal development, thus relieving, to a degree at least, the general systemic evils dependent upon nasal stenosis. The stimulating effect of orthodontic interference extends to all tissues adjacent to those actually operated upon, a fact still disputed by some, but one generally accepted by most thoughtful observers. If advantage is taken of the possible increased masticating capacity after occlusion has been restored, the renewal of this function will have a persistent stimulating effect tending to bring about renewed nasal development; thus the relationship and interdependence of the rhinologist and orthodontist becomes apparent.

The binding of a board on the top of the head of children of the Flathead Indians probably influenced the development of the palatine portion of the maxilla, because the bandages were wound about the mandible, pressing it hard against the maxilla; though if it can be determined that the bandages were not thus applied, then the fact becomes one of

importance, because if any outside influence affecting the development of the cranium affects also the growth of the maxilla it is more than probable that outside influences directly affecting the development of the maxilla might also react unfavorably upon the cranial development.

The essayist's position in regard to the perverted influence of the tongue in mouth-breathers is, I believe, well taken, for under normal conditions it exerts not only a persistent, but a pronounced stimulating effect. This is well illustrated by the excessive development of the jaws and the wide spaces between the teeth of patients who have an unusually muscular tongue.

Dr. Hartz referred to hereditary influences, and mentioned incidentally the large nose and the long face of two radically different types. I happen to know, from many conversations with the Doctor upon this subject, that he does not believe such conditions ordinarily result from the intermarriage of different types, but the very fact that it does at times occur must be explained before we can say that children *never* inherit certain anatomical characteristics from one parent which are out of harmony with certain other anatomical features like those of the other parent.

This society, as a whole, has heretofore credited heredity with a very unimportant place as an etiological factor in the production of malocclusion. I can not help but feel that this position has been an extreme one, and that eventually further investigation will reveal its importance.

Dr. Burt Abell, Toledo, Ohio.

It has occurred to me that the depth of the inhalation must be influenced directly by the orifice through which the air enters. A given quantity of air passing through a smaller orifice would require a greater length of time. In nasal respiration, the orifice being smaller, there is a greater pull of the respiratory muscles in the effort to get the requisite amount of air. This effort gives tone to these muscles, and deepens the respiration. The deeper the respiration the greater the amount of oyxgen, and the better the tone of the whole body.

In 1885 Zeim performed the laboratory experiment of stopping permanently one nostril of young animals and found that there was a corresponding lack of development on that side of the head. Collier, in London, tried the same experiment, stopping both nostrils, and found the lack of development was bi-lateral. When we take into consideration that there are twenty-five thousand struggles for breath in the course of twenty-four hours in a bad case of adenoids, and this not for one day, but for days and months together, with no relief, we begin to see why there is the worn, tired expression we see so often in these cases. Yet I believe we have not placed enough emphasis on the one factor in these

results that is of paramount importance. When the child is asleep there is a constant action of the sub-conscious brain, opening the mouth, operating the muscles, etc, through the reflexes, all operating in an unnatural way, overworking this brain. There is brain fag, so to speak, How can the child be bright mentally? It is taxed beyond the fatigue limit all the while.

After examining a great many skulls of the aboriginal races, in which he found scarcely any malocclusion, Catlin says if he were to attempt to bequeath to posterity the most important motto human knowledge could convey it would be told in three words, "Shut your mouth."

Dr. Varney E. Barnes, Cleveland, Ohio.

I was much interested in Dr. Hartz's paper. I noted particularly his remarks regarding growths in the nasal passages occurring between the ages of one and seven years—and then the stoppage until about sixteen years of age, if I understood him correctly. Therein lies the key to malocclusion of the teeth, I think. I have been observing very young children for five or six years now—seeing many of them at birth, and noting in most of those instances the healthy condition of the child and its mother. The children suffering from these troubles are almost invariably "bottle babies," and have suffered from malnutrition. The air passages are deficient. Nor do you find proper growth spaces between the incisors, cuspids and temporary molar teeth.

The remarks of Dr. Watson that we should consider malnutrition, heredity, abnormal breathing, etc., all as factors, seem well taken. We may have a predominant factor, of course, which operates until the cycle is established, working against the child more and more as time goes on.

My observation has been that all of these irregularities of any consequence are shown in the temporary teeth. All of them.

Dr. Ottolengui.

I suppose we all agree that nasal obstruction and mouth-breathing are factors in the production of malocclusion. I call your attention to the fact that in explaining how the mouth-breathing produces malocclusion, we have heretofore heard more about the influences of malevolent forces—depression of the jaw, muscular pressure, etc. Thus it has been explained mainly along mechanical lines. I do not deny any of these causes, but it seems to me the more important point is that the poor breathing contributes to malnutrition, and the latter to a lack of development of the parts.

There is a paragraph in the essayist's paper to the effect that if an arch is undeveloped, the large teeth growing into it must necessarily come in crowded. That, gentlemen, is quite different from inheriting a

small jaw from one parent and a large set of teeth from the other. You would find such a case difficult to correct. But when normal development is checked by prompt and early interference we may re-establish development and produce the full size of arch which that individual should have had.

I take issue with the essayist on one point. It does not seem to me that the fact that a deflected septum has been found in an embryonic fetus proves heredity. If so, then all congenital faults are inherited, because all physical defects found in a newly born babe must have existed in utero—such as cleft palate, for instance. I can not believe very much in the heritage of actual deformity.

Dr. Henry J. Hartz.

In reference to the finding of deformed septums and spurs in the embryo at the sixth month, one of our best embryologists and anatomists, Professor Mihalkovics, of Budapest, reported having noticed them. He did not say how they were produced, whether by injury of the embryo, or by inheritance from ancestors. No one can tell. Dr. Abell spoke of nasal respiration affording better chest development. It is unknown to me how the additional pressure is obtained, that can not be had by oral respiration. Rhinologists are beginning to appreciate the work of the orthodontists more and more. On a recent trip to the East I noticed that their interest is aroused and more mutual. The claims of the orthodontists that they can enlarge the nasal space by mechanical means is not quite admitted, although the theory that by stretching the arch the palate is assisted in its descent appeals to reason. Careful measurements would decide the matter. The co-operation of rhinologists and orthodontists will accomplish much for humanity in correction of faulty nasal respiration and imperfect mastication. The correction, however, should be undertaken during the early development period. The broadening of the child's face takes place principally during the age of from two to five years. Any obstruction in the nasal region at this time would have a tendency to prevent the normal growth, and a more or less narrow face is the result. In fact, the entire face is retarded in its proper growth by the failure of the respiratory function of the nose. The diseases produced by mouth-breathing aid in the arrest of development, especially by the catarrhal and the digestive disturbances. I think the obstruction should be removed as early as possible, and hygienic and medicinal measures instituted to prevent malnutrition. The family physician is usually the first to see the difficulties in the child, and I propose to spread this new knowledge of orthodontia and rhinology in the medical societies.

I believe stenosis of the nose and mouth-breathing is the first etiological cause of malocclusion, the two factors working together, inducing a limited maxilla and palate, in which the teeth can not normally find place. It is conceivable that malnutrition might initiate or work at the same time in maldevelopment of the facial structure. Through faulty metabolism, either during embryonic existence or later when bottle fed, the child's blood stream may abound with imperfectly oxidized food, irritating in nature, which sooner or later begets an increase in the size of the turbinated bodies of the nose and in the tonsils. Such children are said to have inherited a rheumatic diathesis, and sometimes have large tonsils at the first or second year. In conversation with Professor Kilian, of Freiburg, a noted authority, I was impressed with the etiological difficulty of this subject. He seemed inclined to the belief that nasal stenosis and oral respiration were the paramount factors in the production of these deformities; but he also believed that inheritance plays an important predisposing role.

SOCIETY PAPERS

The Laws Determining Casting or Fusing Results, Their Control, and a New and Rational Technique.

By Weston A. Price, D.D.S., Cleveland, Ohio.

Presented informally before the Seventh District Dental Society at Rochester, March 31, 1908, and before the Cleveland Dental Society, April 6, 1908.

To every one with high ideals there certainly has frequently, if not continually, come a consciousness that gold and its alloys when built into large pieces for dental restorations, whether cast or fused, did not produce either exact or uniform restorations. This has been particularly serious and annoying in bridge work, and the extent of the error has been in proportion to the size of the piece, while the distress it gave the operator was in proportion to the height of his ideals. This constant error has been chiefly produced by the contraction of the metals on cooling, and the contraction of the investment on heating, granting that the operator's technique has been faultless.

The writer has undertaken to accurately determine the extent of these expansions and contractions of the principal metals and investing materials, though it has proven an enormously difficult task. So far as we have been able to ascertain, there have been no previous determinations of the extent of the contraction of the metals we use on cooling from their melting or freezing point to ordinary temperature. The Bureau of Standards, Washington, informed me that, "It is a known fact that metals do contract when cooled, and this contraction may amount to a considerable percentage of the original volume if the metals are cooled from the melting point to ordinary temperatures." They could not give any more definite information.

There have been some determinations made as to the rate of the expansions, per degree, at low temperatures, which, however, gives little light because of the increasing rise in rate with the rise in temperature, and also the total distance from the melting point. None of the alloys of gold we use have even had these observations made.

Tests of Contraction of Gold.

Our first method was to construct an instrument that would magnify the change in dimensions 1,000 times, and in it bars were measured for shrinkage which had been cast from wax models made on iridio-platinum pins which fitted tightly into holes in the short arms of this instrument. After producing many bars of each of the many gold alloys and of pure gold, it became very apparent that some error was being introduced, since no two bars of the same metal were exactly alike, and often had a very large variation. This error proved to be due to two factors, chief of which was the change in dimension of the mold in the investment; in other words, was due to the shrinkage of the investing material. To eliminate this error entirely required an investment or form to cast into, which would have an exceedingly slight change in dimension due to change of temperature. The best substance available for this proved to be fused pure quartz, a new and scarce product of science. A box was ground into this material one inch in length and the 24 k. gold and its alloys were in turn cast into it and measured. For measuring these changes of dimensions and those of the various investing materials at different temperatures a very sensitive instrument was specially constructed. It will measure with great accuracy changes of dimension to the hundred thousandth part of an inch, and has an electric heating device, and a pyrometer reading to 2,800 degrees F. to show the temperature of the piece being heated and measured. With this the expansions were recorded for all the various metals and alloys up to the sagging point, which was usually several hundred degrees below their melting point. These are shown in Table I. Curves were plotted for each and extended to the melting point, as shown in the last line. At this time the fusing points are not accurately known, but will be published later.

Bars of gold or its alloys cast in this fused quartz chamber, which itself had a relatively very constant dimension, showed in some cases close agreement to the total contraction as estimated from the readings of the expansions up from normal, but to my great disappointment different casts of the same metal showed different total contractions, which clearly indicated that another unsuspected source of error existed, for if conditions are the same results must be the same. This difference in dimension of the various casts of the same metal or alloy made into

Expansion per linear inch for gold and its alloys, and silver, platinum-iridium, aluminum, copper and zinc from 0 to 1,000 degrees F., expressed in thousandths of an inch.

Temperature	Gold 24 K.	Gold 22 K.	Gold 18 K. Clasp Metal	Gold and 5% Platinum	Gold and 20% Platinum	Gold Solder 18 pt. Gold 2 " Silver 2 " Copper 2 " Zinc	Silver Pure	Silver Sterling	Platinum Iridium Alloy	Aluminum	Copper	Zinc
Air (75°)	0	0	0	0	0	0	0	0	0	0	0	0
100	.2	.3	.1	.3	.4	.4	.3	.3	.2	.5	.3	.3
200	.5	1.2	1.	1.	1.3	.9	1.5	1.5	.4	1.7	1.	1.4
300	1.5	2.3	2.	2.	2.2	1.7	3.	2.8	1.	3.	2.1	3.3
400	2.5	3.4	3.1	3.4	3.2	3.	4.4	4.	1.7	4.1	3.2	5.3
500	4.2	4.5	4.5	4.6	4.2	4.3	5.6	5.4	2.3	6.2	4.4	8.
600	5.7	5.7	5.7	5.4	5.2	5.8	7.	6.9	3.	7.8	5.7	10.
700	6.9	6.8	6.8	6.4	6.4	7.2	8.4	8.2	3.7		3.7	12.
800	8.	8.	8.	7.3	7.3	8.3	9.9	9.4	4.3	Metal Softened	7.8	
900	9.	9.2	9.1	8.1	8.1	8.9	11.1	10.5	5.		8.8	Metal Softened
1000	10.	10.3	10.3	9.	8.9	9.2	12.8	12.	5.9		10.	

**Expansion estimated to fusing point from these expansions.*

Gold 24 K.	Gold 22 K.	Gold 18 K. Clasp Metal	Gold and 5% Platinum	Gold and 20% Platinum	Silver Pure	Silver Sterling	Copper	Zinc
22.	22.	21.	22.	23.	24.	21.	22.	14.

Total contraction per linear inch of bars of gold and its alloys, and silver, cast under definite pressure, expressed in thousandths of an inch.

Pressure of Molten Gold on Bar	Gold 24 K.	Gold 18 K. Clasp Metal	Gold Solder 18 pt. Gold 2 " Silver 2 " Copper 2 " Zinc	Silver Pure	Gold and 10% Platinum
0.	22.5				
1/50 oz.	20.5		18.		
1/10 oz.	18.				
3 lbs.	14.			20.	
5½ lbs.	13.	15.5	15.		14.

* The fusing points for the alloys are not definitely determined yet.

TABLE I.

the chamber of the fused quartz proved to be due entirely to the difference in casting pressure, and it was proven that any given pressure will produce constant results, other essential conditions remaining constant. For example, pure gold cast under one pressure contracted eighteen thousandths to the inch, and under another pressure only fourteen thousandths; and under another and very low pressure twenty thousandths. Eighteen k. gold solder at a given high pressure contracted fifteen thousandths, and at a given low pressure eighteen thousandths on repeated tests. The great significance of this will be apparent to every one as well as its natural lesson, viz.: if we are to get constant results we must use constant pressure as well as have other conditions constant, and to secure least contraction we must use as high pressure as possible without producing distortion of the investment, an important point to be taken up later.

Effects of Pressure on Cast Metals.

It also suggests that there is a very great difference in actual results produced by the various casting devices because of the great difference in the actual effective pressure, which varies through enormous ranges with some casting investments. Where the pressure is obtained from gas or air it is equal to the cross section area of the inlay or mold, not the gate or sprue, in fractions of a square inch divided into the pressure per square inch of the gas. For example, if the cross section area of the inlay is 1-8 of an inch square, it will be the 1-64 of a square inch, and the pressure 16 pounds per square inch the actual effective pressure will be 1-64 of 16 pounds, or 1-4 of a pound, less the back pressure of the gas retained in the investment behind the gold, and the leakage of the pressure around the gold, for if the pressure can get away through the investing material easily from behind the gold, it can easily get past around it in the same way; which means that there would be considerably less pressure than 1-4 of a pound, depending largely on the compactness of the investing material and the leakage of the closing device over the molten gold. The writer believes the effective pressure under the above conditions to be less than 1-8 of a pound actual pressure. The weight of the mass of molten gold exerts only the pressure of the weight of a column of gold the size of the inlay.

With a centrifugal machine the actual effective pressure is the weight of the mass of molten gold, for our purpose irrespective of its shape, multiplied by the square of the velocity of the gold in feet per second, divided by the radius in feet (not diameter) of the circle it moves in, divided by 32 to change poundal units to pounds pressure.

For example, if 1-2 ounce of gold, which is 1-24 pound troy, is revolving at the rate of ten revolutions per second, which is 600 per

minute, in a circle of a diameter of ten inches, the velocity in feet is 10x3.14x10 ÷12=26.17 feet per second, and the pressure 1-24 pound multiplied by 26.17 squared, the velocity, divided by 5-12 the radius in feet, divided by 32=2.14 pounds actual pressure on the inlay, and if the revolutions are twenty times per second, which is 1,200 per minute, the actual effective pressure is 8.56 pounds, or if only five revolutions per second .53 or 1-2 pounds. Remember the pressure increases as the square of the velocity. If this pressure is on an inlay 1-8 inch square it is equal at five revolutions per second to 34 1-4 pounds per square inch, at ten revolutions per second to 137 pounds per square inch, and at twenty revolutions per second to 548 pounds per square inch, and without decrease for back pressure or leakage as in the case of a gas pressure. If an ounce of gold is used instead of one-half ounce the pressure is double the above. The friction of the gold on the tapering walls of the gate will make but little correction of the above figures if the gate walls are not at a wide angle to each other, which they are not in practice. This reduction of force would, however, be in part counterbalanced, while the gold is in motion, by the inertia of the gold producing an increased pressure in the gate, like the tide in the neck of the Bay of Fundy.

With the casting machine giving 1-100 of a pound actual pressure on the inlay, the total contraction on cooling of pure gold will be about twenty thousandths per inch, or two per cent., and with the machine giving 5 1-2 pounds a contraction of about thirteen thousandths. The latter pressure, please note, requires a harder investment to keep a smooth surface, but other conditions being equal it is seven thousandths, or seven-tenths of one per cent., or one-third nearer a perfect fit than the inlay made at 1-100 of a pound pressure, which will amount to a considerable factor in casting a long bridge. This you will see is a very important method for reducing the contraction and is accomplished by replacing the contraction with new gold from the gate by means of the pressure on the semi-fluid gold whose contraction is greatest nearest its liquid point. There is another possibility of correcting, at least in part, this error in our work due to contraction of the metal, though it is now very often a means of increasing instead of diminishing it, namely, the investing material.

Errors Due to Manipulation of Investment.

The writer is sure that few dentists realize the enormous errors that may be and are generally introduced by the manipulation of it. For example, if any typical ordinary investing material is mixed very soft and allowed to set and dry out for a day or two, or over a slow, long continued heat, it will contract an extent as much as twenty-five thousandths. If the gold is cast into this at a low pressure, the

total decrease in the size is over forty thousandths, or over four per cent. Even this enormous error will not readily be seen in small inlays because of the lap on the margins. It would, however, show in bridges. To correct this error by forcing the cast under high pressure means only to make it so-called "tight," or "too large," by producing distortions or beads. I have, with very much labor, tested the actual expansion or contraction of all the available investing materials, both in the process of setting and drying out and heating, and find a great variation with different investing materials under the same conditions, and of most of them under varied conditions. It will be clear to every thinking operator that to make even a relatively perfect reproduction we must have an expansion somewhere that will compensate for the uncontrolled contraction of the gold or alloy. Theoretically this can best be done by expanding a model of the cavity or bridge as by soaking a cavity model in material containing agar agar or gellatin; but practically it is most easily done by expanding the investment. At this point the distortion of the shape of the mold or cavity by heating the investment should be discussed, but space will not permit. It may be considerable, however, if the cavity is large in proportion to the thickness of the walls of investment around *it, if heated unevenly and rapidly, or this distortion will be small if the volume of the investment is large everywhere as compared with the size of the cavity or mold and heated evenly and slowly.* This is very important; a large cast MUST NOT be made in a small investment cup. Notwithstanding the fact that some investing materials on the market are "guaranteed not to contract or expand on heating," they fortunately do expand. Some contract, some do both, but unfortunately none expand enough to correct the error of the contracting gold. Table No. II gives the expansion or contraction shown by plus or minus sign of the various investing materials that the writer could obtain, first, from the mixing initial set to a thirty-minute set; then heated slowly in the electrically heated sensitive thermo-micrometer and readings of dimensions taken for every 100 degrees F. rise in temperature. I have taken the inch and Fahrenheit scales instead of the metric and Centigrade because they are more familiar to all.

It will be noticed in general that plaster alone, or as a binder for other materials, has an initial expansion to about 300 degrees, and then a very marked contraction, the plaster disorganizing at about 1,100 degrees, from which point the contraction is exceedingly rapid, making it impracticable to heat any investment in which it is the binder up to or above that temperature. An actual effective pressure on the inlay of 5 1-2 pounds will reduce the contraction of the cooling gold from twenty

Expansion and contraction shown by + and — in thousandths of blocks of one-inch cube of the present investment materials.

Temperature degrees F.	Pelton and Crane	½ Pelton and Crane ½ Plaster	Brophy's Imperial	½ Imperial ½ Plaster	Sump	½ Sump ½ Plaster	Dendrolite	½ Dendrolite ½ Plaster	Fyrite	½ Fyrite ½ Plaster	Peck's	½ Peck's ½ Plaster	Plaster Paris Medium Stiff Mix	Plaster Paris Thin Mix	I. D. L. Investment Composition	½ I. D. L. ½ Plaster	Dr. Taggart's	½ Dr. Taggart's ½ Plaster	Plaster set for 15 minutes	Plaster set for 15 hours
Started	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30-minute set	+1.8	+1.	+ .9	+ .8	+ .9	+1.	+ .9	+ .5	+1.	+ .5	+ .7	+ .7	+1.3	+1.	+ .7	+ .8	+ .7	+1.	+ .5	0
100	+1.8	+1.4	+1.2	+1.	+1.4	+1.3	+1.1	+ .9	+1.	+ .8	+ .9	+ .9	+1.4	+1.3	+1.1	+1.2	+1.3	+1.3	+ .9	+ .1
200	+2.5	+2.5	+2.2	+2.8	+2.9	+2.4	+2.3	+2.1	+2.4	+1.9	+3.1	+2.2	+2.6	+2.5	+2.	+2.8	+2.3	+2.5	+2.4	+ .6
300	+3.2	+4.	+3.1	+3.	+4.	+3.5	+3.5	+3.6	+3.8	+3.3	+3.7	+3.1	+4.5	+3.	+3.2	+3.6	+5.1	+3.2	+2.6	+1.5
400	+4.	+4.	+4.	+3.4	+4.	+3.4	+3.3	+3.6	+3.8	+3.4	+4.5	+3.2	+4.5	+2.5	+3.8	+3.8	+lost	+3.4	+2.5	+1.9
500	+4.8	+3.8	+4.4	+3.4	+3.8	+3.	+2.8	+3.5	+3.3	+3.2	+5.1	+3.	+4.3	+1.9	+4.1	+3.5	+6.2	+3.2	+2.2	+2.1
600	+5.2	+3.7	+4.4	+3.3	+3.5	+2.5	+2.4	+3.4	+2.9	+2.8	+5.7	+3.	+3.9	+1.	+4.6	+3.4	+6.8	+2.9	+1.5	+1.7
700	+5.7	+3.6	+4.5	+3.	+2.8	+1.7	+1.5	+3.2	+2.	+2.5	+6.4	+2.9	+3.4	— .1	+5.2	+3.	+7.3	+2.5	+ .8	+1.
800	+6.3	+3.6	+4.6	+2.8	+2.1	+1.	+ .5	+3.	+1.4	+2.1	+6.9	+2.8	+2.6	—2.	+5.5	+2.9	+7.7	+2.3	— .2	+ .4
900	+6.7	+3.5	+4.8	+2.5	+1.2	0	— .5	+2.9	+ .6	+1.3	+7.2	+2.5	+1.4	—3.8	+6.	+2.5	+8.3	+ .7	—1.5	— .3
1000	+7.1	+3.3	+5.	+1.8	+ .2	— .9	—1.8	+3.5	— .5	+.3	+7.8	+2.	0	—6.5	+6.6	+2.	+8.5	+1.4	—3.3	—1.
Tot'l contraction on cooli'g	—5.	—11.	—10.	—12.	—15.	—14.	—35.	—14.	—12.	—15.	—7.	—11.	—18.	—24.	—8.	—15.	—6.	—11.	—18.	—15.

TABLE II.

thousandths to about thirteen thousandths of an inch per inch, and less pressure will in proportion, which error we should be able to correct to any definite known pressure we are using by simply heating the investment a few hundred degrees to a definite temperature, and the lower the better, since the surface is usually injured by high heating.

It will be seen that the best that any of the investments now available will do is to expand 8.5 thousandths as a maximum at 1,000 degrees F., which is an extreme temperature, and we should have an expansion of at least 15 thousandths at not to exceed 700 degrees, at which temperature all are very far short, and the best have only half expansion enough, and those that are highest have so little strength that high pressures are likely to distort them if used pure without the addition of more plaster, which, as you see by the chart, rapidly decreases the expansion. The writer has effected a combination with excellent working qualities and smoothness of surface and density that expands 12 thousandths at 700 degrees, which will be discussed later, and which can probably be still considerably increased. Note in Table II that all the investments have a very large total contraction on cooling after being heated. We regret space will not permit of a discussion of the remarkable data shown concerning our present investing materials.

Unfortunately one of the most difficult parts of the usual procedure of producing a cast restoration is the securing of a wax model that is closely accurate because of the conditions under which it is made and the nature of the substance. Many of the most desirable restorations to be made in this manner, such as bridges fixed and removable, cannot be produced as a complete wax model in the mouth, the methods of the most skilful so far as I can learn being to construct in parts or units, and assemble and braze together. Aside from these extensive wax models it is exceedingly difficult, and in many cases quite impossible, to produce a really closely accurate wax model of simple cavities, and largely because of the sliding tendency of semi-fluid masses unless supported on all sides equally at the same time, which conditions we can not effect under the circumstances and methods of its making. This is not simply a source of possible error, but one of certain error in many, if not most, cases; and in some of the so-called best operators' hands, unless his ideals are very high, it does not always seem to alarm him.

An ideal procedure, both from the standpoint of the comfort of the patient and operator and of exactness of results, requires that the least possible of the detail be accomplished in the mouth, and that the results be as exact as possible, which means very exact in fit, contour, occlusion and approximate contact, the latter of which is particularly difficult

to obtain accurately by the present method of the wax model. Except for the inconvenience of removing the tooth, or teeth, in question and replacing them, the ideal method from the standpoint of perfect technique would be to be able to take the teeth involved and surrounding tissues and petrify them, and cast the restoration directly into the cavities themselves, but even this, though it were possible, would not correct the error of the contracting metal, which is an absolute barrier in exact bridge restorations except by building up in sections which simply diminishes it.

The Author's Artificial Stone Model.

Based on the foregoing data and the conditions involved the writer has developed a technique which so far reduces the errors and eliminates the discomforts that it has entirely revolutionized his methods, and has eliminated more discomfort to his patients than anything in his experience, and so far as he knows it is entirely new. In brief, it is the reproduction of all the parts involved in an artificial stone that is almost as hard as the teeth themselves, and harder than some of them. It has an expansion on heating that nearly corrects the contraction of the cooling metal. The filling is contoured in warm wax, and the metal is cast directly upon this model, and is not removed until completely polished ready for cementing. It withstands a temperature above that of an alloy of half platinum and half gold, and heat only hardens it. The margins of the frail walls are reproduced as strong almost as the tooth itself. Some of the many advantages are as follows: Reducing to a minimum the work in the mouth; completing the adjustment of the occlusion and contact points outside the mouth; having a dry non-vital structure to design and construct upon with perfectly free access to all sides and aspects, including the gingival margins, both for constructing and finishing; a rigid model or mount to hold your piece upon for finishing, eliminating the danger of distortion of margins and discomfort from heat in polishing, or of the inlay being caught upon the polishing disks, etc.; a hard, smooth surface to cast upon that will withstand any pressure desired without possibility of pitting or distorting, allowing of very high pressure in casting; a model so strong as to reduce the contracting tendency of the gold in part by withstanding it, causing the metal to stretch where it is held by the model; a rigid reproduction of the tissues and surrounding parts which are always with the piece being restored and an important aid in designing and finishing; a model upon which porcelain can be designed, formed and fused without removal from its surrounding relations.

The detailed procedure is as follows: An impression of the cavity desired and surrounding parts is secured by one of the following methods as is best adapted to the particular condition. A simple occlusal, or buccal, cavity not involving a contact or occlusion point can

be most quickly produced by a platinum lined wax impression made by pressing platinum foil of one five-thousandths of an inch, and not exceeding one three-thousandths in thickness into the cavity with cotton and removing and annealing and filling with an excess of a medium low heat, hard, sticky wax. Replace in a nearly chilled condition, and press to place with oval headed burnishers, and by the patient biting on rubber which forces the very thin platinum into every detail; chill with cold water and remove without making any effort to shape the exposed surface of the filling. A large excess of wax is desired. Have the platinum

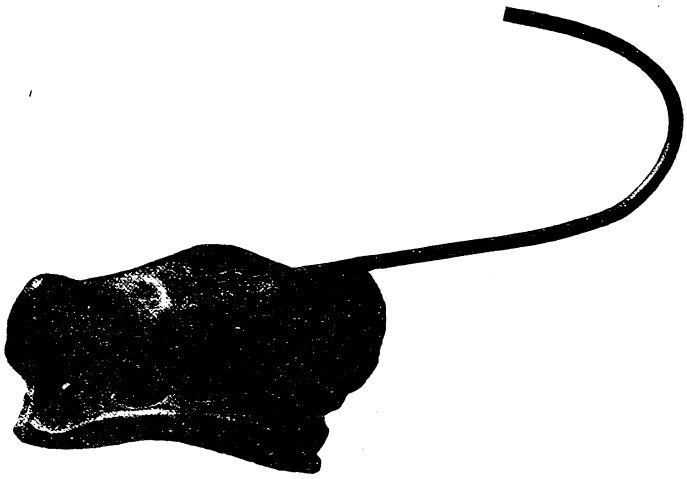


FIG. 1.

extend beyond the cavity to give contours of the surroundings, and have it well supported with the wax. Fill the back of the impression with the artificial stone and place over the heat. Soak up and burn the wax, and in three or four minutes you can fuse pure gold into the platinum to suit, and polish completely on this hard model as if in the cavity. Always expect to burnish the margins, or maybe dress slightly, but both yourself and patient will be delighted to see how often only the burnisher is needed, for I believe no method yet produced approaches this for exact margins and restorations.

Accurate Impressions of Cavities.

This same simple cavity could as well, if desired, be filled by taking an impression of it in the following or some other quite exact manner, producing the model as before, filling the cavity with

melted wax and casting into the model and polishing on the model as before; but this procedure of so simple a case takes a little more time.

Suppose the conditions to be large approximal cavities involving the mesial surfaces of the lower first molar and second bicuspid. It is always understood that the cavities themselves are so prepared that they will draw perfectly free. A wire is bent the shape of a shepherd's crook, to pass along the buccal surfaces and through these cavities, and either forward or backward a short distance on the lingual surface. On this wire frame a ball of warm impression compound, preferably a hard variety, is placed and the patient allowed to bite on it with the wire in the position stated. This, after quickly chilling, is removed and becomes the impression tray (Fig. 1). Nothing is done to the side which is the impression of the upper teeth, which is perfect enough for an articulating model since on it you do not require sharp cusps so long as they are exact in length; in fact, better not in order to allow for natural side motion. The lower side of this bite is dried with a blast of compressed air with or without drying first with alcohol, and into this dry mold, which is now the tray, drop from the stick a few drops of hot orange sticky wax enough for a thin layer; then place quickly into the mouth and have the patient bite into natural position again, which forces the soft wax into every indentation of the cavities, even under the free margin of the gum.

After chilling remove and pour both sides with the artificial stone, with or without mounting on an articulator as the nature of the occlusion may require. There are many little points, but important, which might not generally be thought of, but space forbids mention now, such as the caution not to allow the impression to extend to places that will disturb its drawing perfectly from the cavities, and also hold it tightly in contact with the teeth on the jaw with the cavities, while the patient is removing the teeth from the other side of the impression. If the gingival margins of these cavities are not free of gum tissue a procedure to be described later is employed.

When the models are hard, which takes an hour or two, and are removed from the impression, they are exceedingly perfect reproductions of the cavities and surrounding parts. These two cavities could be flowed full of wax and cast together and cut apart, thus destroying the contact points; a bad procedure. A beautiful piece of technique at this point is possible. With wedge cutters fracture the model between the teeth to be filled, thus exposing the approximating surfaces and the fine gingival margins. Fill the cavities with wax and shape to liking with perfect ease, and get the contact points by placing the fractured surfaces together again, and also to adjust the contour and occlusion with the articulating model of the other jaw. Now cast each filling separate from

the other, but direct into the models, which are invested in the usual way. Their fillings are then polished completely on the model, and their contact and occlusion points again verified, and I believe you will have a moist eye from gratitude at the ease and perfection with which those cervical margins can be polished to correct lines and ideals of contour that are entirely impossible under the conditions in the mouth, for as you

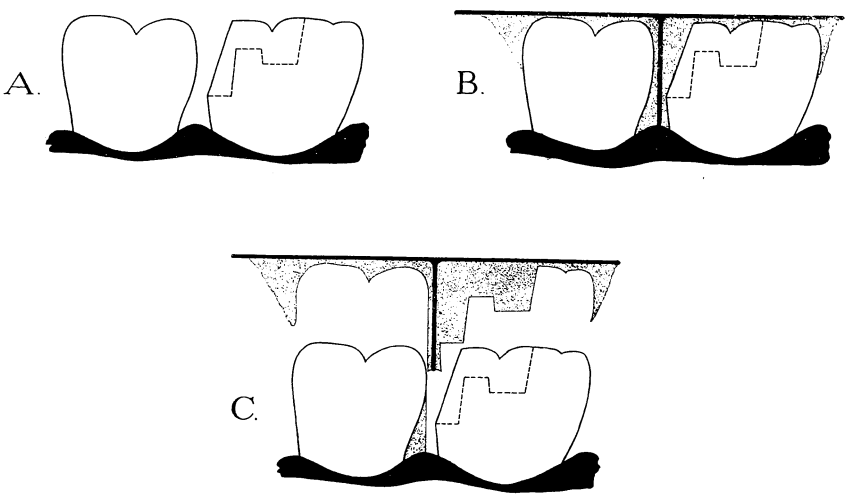


FIG. 2.

hold the model carrying the inlay in its place, you are able to see unobstructed all relations, and produce results that are entirely impossible in the mouth. The gratitude of your patient will be beyond money values.

A more difficult class of cases is where there is an undercut under the contact point of the adjoining tooth, a class of cases that has given much trouble for all restorations by impressions or wax models. A simple device has made this hardest of cases one of the simplest. A piece of brass 22 gauge, say one-half inch wide by an inch or two long, as desired, is the foundation for the tray. To this a partition of thin brass, say No. 28, is fastened with soft solder and is wide enough to reach the length of the crown to the gingival tissue and slightly press it. Suppose the condition to be a cavity in the distal surface of the first lower molar with the second in good condition, and its mesial surface

forming an undercut which ordinarily of necessity would distort any impression of the cavity that included all these surfaces. This is shown in Fig. 2A. The impression material is in place in Fig. 2B and, as shown, the partition entirely separates the pressure influences of the opposite tooth walls. The mass in the undercut below the contact point of the second molar is removed from the impression on its withdrawal, and can be of no use to us (Fig. 2C). When this model is completed, all the desired information and conditions are supplied and the wax filling is molded to the contact point as desired and then cast. The second molar on the model will be fractured off for polishing, and may as well be

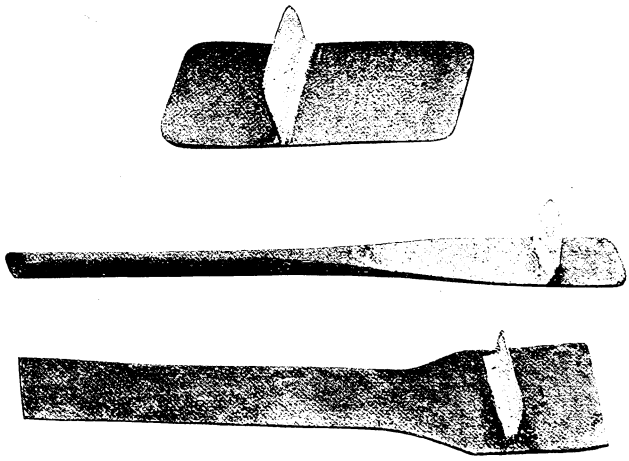


FIG. 3.

before casting, but temporarily replaced for correcting the contact point. A number of these trays made especially for practical cases are shown in Fig. 3. It took three minutes to make two of the trays recently. You can not fully estimate the great advantage of this procedure until you try it and note the exact result made possible with little labor.

For crowns this method is particularly adaptable. A cast base is made for a porcelain crown with all the surrounding structures reproduced and always in place. If both of the adjoining teeth have undercuts as the last case, two of these partitions are placed to prevent distortion of the impression and yet preserve the contact points.

Restoration of Incisal Angles.

Probably no class of dental restoration is as difficult for the operator to satisfactorily make as the broken incisal angles of the centrals, because the opportunity for anchoring is so limited and the exposure to hard strain so great for all porcelain fillings in this position. With this method the teeth involved and the adjoining ones are reproduced on the stone model along with the ones containing the cavity. The anchorage for such a case must be on the palatal surface. This angle is restored by a compound metal and porcelain filling. Gold and 10 per cent. platinum alloy is cast to reproduce all the lost structure except that when the wax model filling is built, a cavity is cut in the labial surface almost entirely occupying the visible portion. It will be readily seen how much more easily this angle can be constructed of proper shape with the teeth complete in position showing all relations and dimensions. After casting and polishing this gold and platinum hollow faced filling, porcelain of the selected shade is baked directly into this cavity, which has undercuts and is not disturbed, hence needing no cement. All this baking is done with the filling in place on the stone model and the adjoining teeth in position, which all practical porcelain workers will appreciate as being of incalculable value and advantage.

Electric Centrifugal Casting Machine.

I should discuss casting principles in the light of this research work, but can only do so in brief. After designing and making seven different kinds of casting machines for my own use on different principles, I am convinced that the best machine is one with the following requirements, viz.: the pressure is easily adjusted and controlled through a wide range, that is, to a high pressure; with a pyrometer to determine the temperature of the gold and to cast at a uniform and high pressure and high temperature simultaneously, that is, one with a construction that allows the metal to flow into the mold only at the moment it has its high pressure and highest temperature. To accomplish all of these items I have designed an electrically heated centrifugal machine, the crucible of which is left upright until the gold is at the proper casting temperature as shown by the pyrometer, at which time the motor is started and when the speed has attained the point where the pressure desired is obtained, the crucible and investment cup trip and take a horizontal position still revolving at the same speed, and the gold goes into the mold at its known pressure and temperature, which are indicated by the pyrometer and speedometer. Its simplicity and exactness make it possible for any one to make the casts with uniform results, and in the light of our present knowledge of conditions, with

maximum efficiency. The writer has no connection or financial interest in their manufacture, but has confidence in recommending them.

Technique of Making Exact Models.

Another most important development in the writer's hands is a method for making exceedingly exact models that are dense and free from the air bubbles which form so easily when filling an impression or placing the investment material around a wax or other model.

It is very simple and is accomplished as follows: When the impressions of any kind are poured, and the model material is still plastic, they are coated with wax or vaselin and put into a metal chamber containing water, and the top closed tight and a screw piston turned into an appartment of this chamber, thus displacing and compressing the water to a pressure of 1,000 to 1,200 pounds per square inch. Since the pressure is equal on all sides of the impression material and the model material is still plastic it is forced into every nook and crevice without destroying the impression, and the law of the volume of gases that the volume is in inverse proportion to the pressure if we increase the pressure ten times we decrease the volume of the air bubbles to one-tenth. When we increase the pressure to 1,200 pounds, which is shown by the gauge, the actual decrease in the bubbles' size is the proportion of 1,200 to the atmospheric pressure, or 1,200 divided by 14.2 (the mean pressure at Cleveland), or 1-84 its original size. This produces a model of great density and smoothness of surfaces, and when applied to an investment around a wax model has a most beautiful effect on the surface of the cast gold, and the greatly increased density produces a harder investment, and one with greater expansion, as will be shown later.

Special Cement for Cavity Models.

While the writer fully realizes that he probably could turn the control of the composition and manufacture of this model material to considerable financial gain, it would be poor compensation for midnight oil compared to giving it as unhampered and quickly as possible to the profession and humanity, whom he believes will be saved more suffering and discomfort through its means than the writer could relieve in a score of lifetimes binding up wounds. A dozen manufacturers through competition will produce greater improvements and higher perfection than a single one, and the writer will gladly assist in testing results for actual efficiency. This material is of a structure between Portland cement and the so-called silicate cements, the former of which has a large per cent. of calcium, and the latter a small per cent. Both are produced by heating together alluminum silicate and calcium oxid, or hydrate and usually a magnesium oxid or silicate to a definite very

high temperature. The former, Portland cement, forms a cement by the formation of the hydrate by adding water; the latter a compound phosphate on the addition of phosphoric acid.

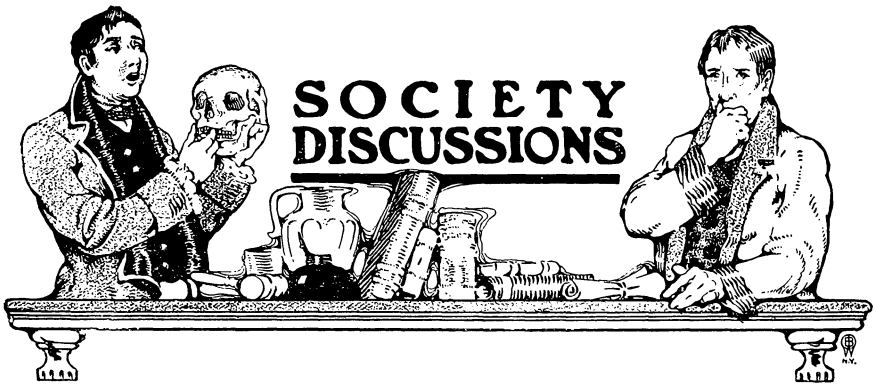
The writer is familiar with the detail technique and chemistry and analyses of the various silicate cements, and zinc and copper oxids, and the varieties and formulas and manufacture of Portland cements, and has made a very large number of special cements, having entirely different properties from any of the Portland or silicate cements, neither of which have the properties we require. The former are generally free from contraction, but set far too slowly; even without the retarder that is put in by the manufacturers they do not get hard enough within a reasonable time. The latter, the so-called silicate cements, have too much contraction and will not withstand high temperatures, nor will the zinc or copper oxid cements, and all have a very large contraction notwithstanding claims to the contrary. This artificial stone is a modified silicate cement, and is made by fusing, as cement makers will know how to do, a highly vitrified alluminum silicate in excess for reaction with the calcium and magnesium oxy-silicates. A product is obtained which forms, with orthophosphoric acid of correct specific gravity, an artificial stone, exceedingly hard and having a constancy of dimensions almost equal to that of the best Portland cement, viz.: a shrinkage on setting which is very low, in some cases as low as two-thousandths per linear inch, and having an extreme density and withstanding a temperature of 2,700 degrees F., very far above the silicate cements, which have a contraction on setting dry and warm of from thirty to forty-thousandths per linear inch and fuse at about 1,300 to 1,600 degrees F. I appeal to the manufacturers of cements, for their own profit and for humanity's sake, to furnish the above in quantities and at prices that will allow of its becoming the almost universal product in the profession's hands for models for all purposes, and chiefly for casting upon. It should be put up in gallon cans, not ounce bottles, for its use, if of right quality at a fair price, will be very large. If the profession appreciates the needs for it, and demands such a material, it will soon come, and competition will soon adjust the price. Patients will bless you over and over again.

Deductions. Some information that should be apparent to every one from the above data is that, to get uniformly the best results, we should use definite uniform temperature and pressure, and keep the pressure on not only until the metal crystalizes, but until its temperature is considerably below that. In a centrifugal machine a definite excess of gold for the sprue or gate, say half an ounce, should always be used; this is very important. Do not heat an investment containing considerable plaster above

400 degrees F. Use as hard and dense an investment material, especially for the base or contact surface of the inlay, as you can; one that will give a very smooth surface, and use as high a pressure as consistent with it. Universal conditions will produce universally good results. This is not simply theory, but is demonstrated by results. Do not conclude from the fact that platinum and irridium have less expansion per degree of heat than gold and its alloys, that they will shrink that much less when cast, but remember that their high melting points give them a longer range through which to contract, making the total shrinkage more nearly equal to the lower fusing metals that have greater expansion per degree. See chart of expansion of metals.

Some of the many advantages of the stone model are that you have as nearly as possible a reproduction of the tooth and cavity and adjoining teeth in a close casting, on which your inlay is designed, formed, cast and polished, thus exchanging the difficult procedure of making a removable wax model under the hampered wet conditions in the mouth for the simple one of melting and molding the wax into a dry model, where all parts and positions are accessible, even the temporary or permanent removal of the adjoining teeth to give access to the cervical margin, which is of incalculable advantage, and also for producing an ideal contact point and occlusion. In this mold or cavity the filling is cast with any degree of pressure. If done with low pressure it will drop out due to its shrinkage, and if done with high pressure will stick tightly. With the inlay in place in this model it can be finished to more perfect lines and contours than it could be even in the mouth, because of the accessibility, and no one is suffering from the heat of polishing, and it can not fly away, nor can you grind or polish away too much without knowing it, thus enabling the operator, with easy precision, to produce a restoration which, in fit, contour, correct contact with the adjoining tooth, and occlusion with opposing teeth, is very perfect, requiring only to be cemented and the margins burnished, thus freeing the patient from all the detail and discomfort except the few minutes for cementing. Incidentally it will greatly increase the operator's possible service.

This paper, because of its length, will be followed by a short one in the next issue on the relation of the size and shape of the cavity or mold to the investment under various conditions, and the authority for the application of the physical laws as they have here been made.



Second District Dental Society.

February Meeting.

A regular meeting of the Second District Dental Society of the State of New York was held on Monday evening, February 10, 1908, at the Kings County Medical Library Building, No. 1313 Bedford Avenue, Brooklyn, N. Y.

The president, Dr. Hutchinson, occupied the chair, and called the meeting to order.

The secretary read the minutes of the December meeting, which were approved; also the minutes of the January meeting, which were likewise approved.

The paper of the evening was ready by Dr. J. M. Thompson, of Detroit, Mich., his subject being "Individuality in Porcelain Crown Work."

Discussion of Dr. Thompson's Paper.

President Hutchinson.

Gentlemen: We are particularly fortunate, and highly honored, to-night in having with us one who stands pre-eminent throughout the world as an exponent of the porcelain art in dentistry. It gives me great pleasure to introduce Dr. N. S. Jenkins, of Dresden, who is our honored guest, and whom I will call upon to open the discussion on Dr. Thompson's paper.

Dr. N. S. Jenkins, Dresden, Germany.

Mr. Chairman and Members of the Second District Society: I thank you very much for your kind and cordial welcome. I am very proud of the honor of appearing before so distinguished a society. Ex-

actly the subject under consideration to-night is one which has occupied my thoughts for many years, in which I have made a very considerable number of investigations, and which I believe to be of the very greatest consequence to our art. As the essayist so well said, the fixed pin crown has had its day. It has passed away, and the time has now come when the individual crown, representing also the individual character of the man who makes it, comes to the fore.

Requirements of the Profit Crown.

What should we consider as of the greatest importance in endeavoring to replace a crown upon a root? In making a porcelain crown it should be first of all sanitary. It should be so restored that it can by no means become a source of irritation. It should be absolutely clean, and it should be possible to keep it always clean. How can that be obtained?

Let us take the other qualities which it must possess. Secondly, its security; it must endure. It is not sufficient to set a crown so that it answers a temporary purpose; it should be so placed that it is able to endure that which the natural crown can not endure. It should be so complete an evidence of the skill of the dentist that it is not liable to the diseases and defects of the natural crown.

Thirdly, it should be beautiful. It should be so perfect in form and in color as to defy detection.

How are these different qualities to be obtained? If it is to be sanitary, it must be made so far as we now know of porcelain, upon an iridio-platinum base. No other materials with which we are now familiar are so perfectly adapted to this purpose. You all know that where platinum is placed in contact with the gum we are able to keep a far more perfect condition than if the metal is gold. We will not for the moment enter into the question of the superior advantages of platinum—we will take that for granted, because it seems to be a universal experience.

How many of you have seen porcelain crowns, particularly jacket crowns, to which the essayist has referred, and which he has exemplified so beautifully in his drawings, and in some of the specimens which he was kind enough to show to some of us to-day, carried up under the free edge of the gum where you previously had serious difficulty in reducing the root to a sanitary condition, and have found months or years afterward that that gum was holding over that porcelain shell, hugging it and loving it as if it were its own natural tissue? Therefore, we may take it for granted that wherever one has the skill and the time to do it, it is always indicated that instead of a gold crown one should make one of iridio-platinum and porcelain—not that the gold crown has not its uses—not but that there are cases where it may be employed, but

we are speaking now of the ideal crown which we would all wish to make, if circumstances rendered it possible.

How shall it be made secure? There are as many ways as there are practitioners. As there is no royal road to knowledge, so there is no certain and infallible way to be applied to all roots and under all circumstances; but there is this, which we may lay down as an essential principle—the basis upon which the crown is to be built must be immovable. You will remember in the old days when we began to believe that the Logan crown, for instance, was the most perfect crown that could be made—how bitter was our disappointment when, after a certain lateral stress had been applied to a crown which seemed perfect in its fit and securely anchored in its root, that a slight space was formed between the crown and the root on its lingual aspect—how it gradually began to turn out of its position, because the pin was too weak—because it bent and resulted ultimately in the breaking of the root or the displacement of the crown so that it had to be renewed.

Proper Alloys of Iridium and Platinum.

One of the first series of experiments I began to make had in view the prevention of such an accident. After considerable experience I came to the conclusion that it was only with a definite alloy of iridium with platinum that such stability could be obtained. It is futile to work with the lower fusing metals to obtain this necessary rigidity. I have found that it is only by the union of iridium with platinum that such rigidity can be obtained, and for posts which are designed to be set in roots, an alloy of 30 per cent. iridium with 70 per cent. platinum has been found to be most efficient. Iridium is an extraordinary metal, and comparatively little is known of its remarkable qualities; but this is certain—confirmed, I am glad to say, by a series of experiments carried out in the laboratory of a distinguished metallurgist, and the results brought to me a few days ago as I was leaving Paris—that the conclusions to which I had come almost empirically have been in this way justified. Beyond 30 per cent. of iridium such a pin becomes somewhat brittle, and often with 30 per cent. of iridium it will not endure the sudden blows of a heavy hammer. If one wishes to flatten it, one must do it with gentle blows, and a certain breaking up of continuity is observed. I have had them made for my own purpose with a diameter of 1.6 millimeters for the largest, and 1.2 for the smallest; I have had them made slightly tapering with these exact dimensions, and this exact alloy will resist in the mouth any stress put upon them without bending.

That is the essential foundation. We speak loosely of the iridio-platinum wire and pins, and do not readily know what percentage of iridium is to be found in them. It is not an easy matter to obtain exact

alloys; moreover, as there is no money in it we can not expect the manufacturers of dental supplies to be extremely ready to supply such a want. But aside from this alloy, if you will allow me to refer to a subject which is not exactly connected with the one under consideration—the making of a porcelain bridge, it is essential in that work to have not only the pins of this definite alloy of 30 per cent. iridium to 70 per cent. platinum, but it is also essential to have other alloys of iridium. For instance, the first mentioned alloy can not be used in a complicated porcelain bridge for the backbone. That ordinarily requires a certain amount of adaptation. In almost every porcelain bridge the backbone must be curved and bent nearly at right angles. One requires there 25 per cent. iridium, and in the other portions of the work it is essential to use 10 per cent. and 20 per cent. alloy, as I will explain. All of these different percentages are necessary to accomplish a perfect result, in order to make a skeleton upon which porcelain can afterward be melted, and to which porcelain crowns can be attached—a skeleton which is immovable when it is finished.

But to return to the individual crown: aside from the pin which is to be the stable support in the root, comes the question of that which is to cover the end of the root. It is the custom, I believe, in America to use pin platinum plate, or pure platinum plate for that purpose. I have found it much more desirable to use 10 per cent. alloy of iridium with platinum for this purpose, and to prepare the cap which covers the root not by burnishing, for which such an alloy is far too impracticable, but by stamping it until it fits the root end as an inlay fits the cavity in the tooth. This is essential for sanitary purposes. You accomplish the same thing of course with the burnished platinum foil; but you do not have the stiffness and rigidity with pure platinum that you have with 10 per cent. alloy of iridium.

Unquestionably Dr. Thompson in his practice crowns a great number of roots which are deeply set under the gum, which have been telescoped, which have been under treatment for some time, in order to make them healthy enough to bear the crown, and has resorted to innumerable devices to make such roots sufficiently healthy to support the crowns. It is exactly for such complicated and difficult cases that the iridio-platinum is so essential. Take a case deep under the gum with a thick alveolus, you have still a firm root upon which you wish to build a crown. Try to carry up into that place a pin to which a pure platinum cap has been attached, and it is almost inevitable that a certain amount of change takes place. It can so easily be bent. There are many ways of avoiding such an accident, but it is far better to have the cap so stiff that it can be brought up into position, and pressed there without danger of its being moved.

Then, also, if it is a case where one wishes to have a heel or rim about a portion of the root, after having prepared that root so you are able to bring your cap with this band into such position that it can by no means irritate the gum, then it is a matter of importance that you start with a rigid base. You may afterward wish to reinforce it with a still stronger piece, or you may wish to build up your porcelain from it to give it additional support. For all these purposes this definite alloy is of great advantage, for it can be stamped up to form of one piece, both the partial band and the cap, so that it amounts to the accurate fit which you get in an inlay.

Beauty of the Perfect Crown.

Now I wish to refer to the third question—that of beauty. In the beautiful specimens which Dr. Thompson has shown us to-day, beauty is supreme—form, texture and color, everything that one could wish for. How has he obtained these results?

However skilful a dentist may be, he can not always completely match the color he desires in the crown through the porcelains which he builds up and carves and melts—not that it can not be done in a very high degree, but in those most important cases in the incisors and bicuspids, it is often impossible to get that exact match which one wishes, except by selecting the crown. With the innumerable shades of crowns which are now to be had from the manufacturers, we should find one which is harmonious, and having found it, and having ground it and applied it in the method Dr. Thompson has told us, or in some other way which to the individual is most desirable, one has a really beautiful crown, There is no question about it. All the other stages of the process can not change or injure that harmony of color which has been decided upon. It is this point which I wish to emphasize, because there are so many instances coming under the observance of us all where the color has not been properly matched, and where an otherwise beautiful mouth is to that degree disfigured—something we have no right to do. Absolute perfection you may say does not belong to human endeavor. In this respect we can come so near to it that it is difficult to tell the difference; but so far as I know it can only be obtained by the judicious selection of the crown in those difficult cases.

For this purpose, especially in porcelain bridge work, it is most important to have a crown which can be ground and polished. I am told that already in America there are manufacturers who have succeeded in making a modern tooth with the close grain of the Ash tooth, with which practitioners in Europe are so familiar—the English teeth in general. If that is so you are much to be congratulated, for in the adjustment of individual crowns, or the making of a porcelain bridge, it is of great

advantage, especially in bridge work, after your piece is partially completed, to make trivial changes, taking off a bit here or rounding a bit there, to make that which is characteristic of the individual in the shape of the crown, and then be able to polish it so it has a sufficiently perfect surface.

For that purpose we who practice in Europe have found the so-called English teeth indispensable. The range of color is very great, and its density of structure for shaping as one will, is a matter of great importance. We can control it as the sculptor with his chisel controls the shaping of the marble under his hand.

Moreover, and this is a question which as yet, I believe, is not scientifically settled, but which I hope some one will work out—it is in Europe believed that these dense English teeth, low-fusing as they are, have a power of resistance which the higher fusing bodies do not possess; that the latter are more brittle. Whether that be true I am not prepared to say, but certainly that is the general idea which prevails throughout Europe. I find the European practitioners fight shy of using in the porcelain bridge or crown, where great stress comes, a tooth of a very high fusing body.

Individuality.

Last of all I wish to commend the idea of individuality. It is the individual crown of which the essayist has spoken, but it is also the individuality of him who does the work which tells. So long as time endures, so long will there be not only this difference between individuals, but between nationalities. I have had much pride and joy in seeing the great scientific and technical skill of what is called American dentistry. So long as America is, so long also will there be a characteristic American dentistry, as there is a characteristic German dentistry, as there is a characteristic French dentistry, as there is a characteristic English dentistry. The quality and character of the race stamps itself upon that race, whatever it be, but let us not think if we wish to obtain this individuality in work that the individuality of one person or one nation is of supreme importance. The excellencies which one possesses the other may not possess in the same way, but both the individual and the national dentistry is a thing to be worked out upon its own lines, and is worthy of all admiration and respect when a good result is obtained.

Dr. W. D. Tracy, New York.

When I compare the present status of crown-work with what I knew of it in our early days of dentistry, it impresses me with the onward march of the work. Practically all the crowns I knew were banded crowns, then known as the Richmond crown, with a

metallic band around the root. While those banded teeth have served the patient and the dentist as a substitute for the natural organ, the present day method is far superior in all its principles—the products are more stable, more sanitary, the tissues take more kindly to them, and they are more artistic in every way. It shows the general trend of crown work. I have been very much interested in the suggestions made by the essayist. One or two appealed to me particularly. When he is closing the discussion I would like to know more about Figs. 7 and 8. I wonder whether he leaves that little platinum thimble in the baked crown before he sets it, or takes it out. If it were left there I should think it would show a little line at the gingival margin of the facing.

In reference to the biscuited teeth in Fig. 6, my experience has not been altogether satisfactory in that respect. You select a tooth which you think is about right, and submit it to the heat sufficiently so that maximum shrinkage will occur; and by that time the crown will be very apt to have changed its shape. Still you can add to it, of course, if you want to take the trouble. Latterly I have been using a diatoric porcelain tooth, and building on the necessary porcelain between the tooth and the platinum or iridio-platinum base.

Dr. Jenkins always makes very interesting remarks, and we are glad to know what he is doing in Germany. We always get the benefits over here sooner or later, and it is very interesting to know how he has worked out the percentages of the alloys for various phases of the work. I perhaps have not realized the necessity of having those various alloys. When I know more about it probably it will appeal more to me; but it seems to me if a platinum of a certain alloy is serviceable enough for the post, it would also be serviceable for the backbone of the bridge. I believe Dr. Jenkins said it was too brittle.

It gives me great pleasure to hear a paper like this and the discussion, and to notice the splendid progress crown work is making not only toward the practical, but also the artistic; because after all the practical crown that is not artistic does not meet our requirements.

Dr. Hamlet, Brooklyn.

I was very glad to hear Dr. Jenkins's remarks to-night, he has been so closely identified with porcelain work. It carries me back many years to when we first used porcelain. I could never bring myself to understand the advisability of using a double pin in a bicuspid—that is to say, a pin with both points of equal length. To insert that double pin in a bicuspid root it would be necessary to cut that bicuspid root in both directions to give ample space to put both ends in at the

same time. That weakens the root; but if one pin is made considerably shorter than the other you save a great deal of the tooth structure, and I think it is equally as strong.

Dr. Jenkins referred to porcelain bridges. I think I would like to put on record an antique bridge which I made and inserted in 1887—before Dr. George Evans's work on Crown and Bridge Work was published. A cut of that work is in the first edition, and that bridge is still in use in the mouth to-day, for it is not six months ago that I was talking with the dentist who has the patient now under his care, and he said the bridge was still in perfect condition. That porcelain was baked in a coke furnace. If I remember right, it was the Close body. That tends to prove the durability of porcelain, even though baked in a very crude way. That was baked on a skeleton made of iridio-platinum square bars. It was made with the second bicuspid attached to the second bicuspid root with a first bicuspid dummy, and a bar running into the molar with a gold filling around it. It is now in perfect order after all that time.

Dr. J. Lowe Young, New York.

I have known Dr. Thompson for a number of years, and I know the kind of work he is doing, and the great interest he takes in his work. I think you will all agree with me from what he has given to-night that he is a very conscientious worker. There is just one thought I have in connection with porcelain crowns that has not been brought out to-night. It is conceded by every one, I think, that porcelain crowns are more artistic than gold-backed crowns; but the question of stability is often a problem. I have heard men contend that a porcelain face with a gold back is stronger than an all-porcelain crown. I do not think that is true, and I will just give you this thought. When a natural tooth strikes a gold back, it does not wear the gold away, nor does the gold wear the natural tooth; but on the contrary, the gold is condensed by the constant bite of the natural tooth on the gold. Where the all-porcelain crown is used and the natural tooth comes in contact with that, it is worn by the porcelain; no matter how highly glazed the porcelain is it will tend to wear the natural tooth, and will seat itself against the opposing tooth.

Porcelain bridge work I believe, if properly constructed, is the ideal bridge work, but it must be carefully articulated on the model, and I believe to do that it is necessary to use as a bite a metal model of the opposing teeth, and in that way porcelain bridge work can be constructed that will be very serviceable.

Dr. Van Woert, Brooklyn.

I have had a most delightful afternoon and evening. I had the pleasure of seeing some of the work Dr. Thompson has been doing, and some of the specimens he brought with him, together with enjoying the company of our distinguished guest, Dr. Jenkins. I do not think it would be possible for me to add anything, for you all know my pronounced attitude toward porcelain. I believe it is practically the coming material for filling, as well as crown and bridge work. I can not agree entirely with some of the things Dr. Jenkins has said, notwithstanding my high regard for his opinion. I believe crowns can be made from porcelain and carved without using a facing, so nearly accurate that it is almost impossible to detect them, and there is a grave question in my mind whether a crown so made is not stronger than one built against a facing with pins in it.

Personally I feel that, in the large majority of cases I have to handle, I can get better results from a cosmetic standpoint, as well as a practical one, by using a high fusing body and making the entire crown and carving it from that material. I will admit there are cases where it is impossible to get the color, because the variety of high-fusing bodies to-day is limited. There is, however, a great range in the combination of colors, which makes it possible to overcome some of the difficulties we meet, which are difficulties because of the lack of material furnished us by the supply houses.

Dr. Ottolengui.

I suppose it has been the experience of every man in this room to go to clinics and see a clinician show beautiful work. You have seen models with beautiful gold inlays made on ivory teeth, and you have gone away and wondered whether that could be done in the mouth, or whether that same artist did work of that same grade in the mouth. That is what I thought when I first saw the all-porcelain jacket crown. The first of the kind I saw in the mouth—I will not say just where I saw it, because when this gets into print it might be identified—but at a large clinic at a western meeting I saw a gentleman at a chair proudly showing six teeth he had put in one mouth, and if there ever was an array of death-like, inartistic work, it was that.

That set me to thinking of the possible limitations of this particular class of work. When you have the natural crown entirely cut off and simply have a pin protruding up, as in Fig. 1, you know sometimes the difficulty of setting a facing in front of that pin in just the position you want. Now, if you have a part of the natural tooth left you must realize

the extreme delicacy of setting that thin facing properly from every standpoint—from the standpoint of position and naturalness, and everything else.

How many of you have made a beautiful porcelain restoration of a corner of a tooth, and then later on when you were called on to restore two corners in adjacent teeth, how much more than double have you found the problem of making the two together look as harmonious as the one alone?

All this preamble to say I was in Detroit, and the one particular reason I asked the essayist of the evening to come here to-night was because I saw in the mouths of his own patients in Detroit work of this kind—I think in one month there were four or five upper front teeth which were more artistic than any of the specimens he has to show to-night.

I only wanted the opportunity of rising to testify that the essayist is doing this kind of work successfully in practice, and that with him it is something more than a theory.

Dr. Wm. Jarvie. I have listened to this paper with a great deal of interest, and while listening my mind reverted to my early days in dentistry when the only roots that were crowned were those of the incisors, and the crowns were attached to wooden pivots, so that I could not help thinking of the marvelous change in the art and science of crowning the teeth.

I do not want to discuss this paper, I will leave that to those who are practicing this work; but I would like to say a word of tribute to a gentleman who is here, and whom we are honored by having with us, who has done more for the esthetics of dentistry than any other one man—Dr. N. S. Jenkins. This has not been achieved along any royal road. Dr. Jenkins has developed the porcelain inlays or crowns along the road that always leads to success—that of constant, hard, undivided effort. Dr. Jenkins, fortunately, has lived in a region where the working of porcelain seems to have been the natural work of the community. We know that in the district around Dresden, the making of beautiful porcelains is carried to a degree of perfection that is not known in any other part of the world; and he has been fortunate in that respect of having the assistance and aid that could be obtained only in such a community.

He has not only been a benefactor to the dental profession, but to humanity. Just think of what the restoration of broken-down teeth was even a few years ago. Think of its effect on the appearance of beautiful

women, rather than on practical man—great patches of gold on the incisor and bicuspid teeth—and then turn your attention to what it is to-day through the efforts of the guest here to-night—the beautiful reproductions and making art really cover up art to such an extent that it is impossible to detect that art is present at all. I think the community at large is very much indebted to Dr. Jenkins, and as a society we are proud and happy to have him with us this evening.

Dr. Jenkins. I want to express my thanks for the kind and enthusiastic words of my friend, Dr. Jarvie; but I want also to take issue with him. I am only one of the workers. Here in America you have many other workers who have done better work than I have. Do not for a moment forget that if I had never been born you would still be where you are to-day. It was only, perhaps, that I had a little more enthusiasm than some others that I preached in season and out of season the doctrine to which I had been converted. This very kind praise which has come from Dr. Jarvie is in that respect not deserved. I thank you, gentlemen, with all my heart for your kindness.

President Hutchinson. In spite of the fact that Dr. Jenkins is so modest and disclaims any credit, we are all entitled to our own thoughts in the matter. He has done it. Others may have been in the position to do it, but he has done it.

Dr. Dills. I would like to rise and state that I enjoyed the paper very much, and pay tribute to our illustrious guest. I think he was the first to bring out and produce a porcelain that can be generally used, and which has the natural effect we are seeking. I for one am using it every day.

Dr. Thompson. The discussion as to platinum has been very interesting. It is to get rid of the presence of platinum in the mouth that I have done some of the work that I have pictured here to-night, and have demonstrated to the members of this society. The pictures have been made and my paper has been written along that line to get rid of a platinum base of any kind, and to have the porcelain fit the tooth or the root so accurately that no deposits of any kind will adhere to it.

The crown as described here I am sure accomplishes this result. It is a simple crown, as shown in Fig. 2. As I progress in crown work I am gradually getting to the exclusive use of the eight-hundredths and one-thousandth of an inch of thickness in platinum. I get the joints better, and I can work with better satisfaction. I thoroughly believe that in proportion as we approach perfection in the fit of the artificial substitute on the root, we will do away with the necessity of a great amount

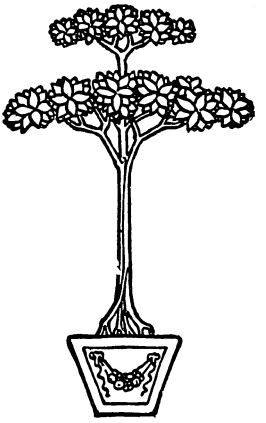
of cement. I depend upon the use of a less amount of cement than in years gone by with the crowns mentioned in the paper, or even the Logan crowns. The Logan crown has a pin which allows of some grinding, and also a cavity for cement. Dr. Jenkins brought out the faults of the Logan crown, that it does not stay in place, that we must have a rigid foundation and depend upon that.

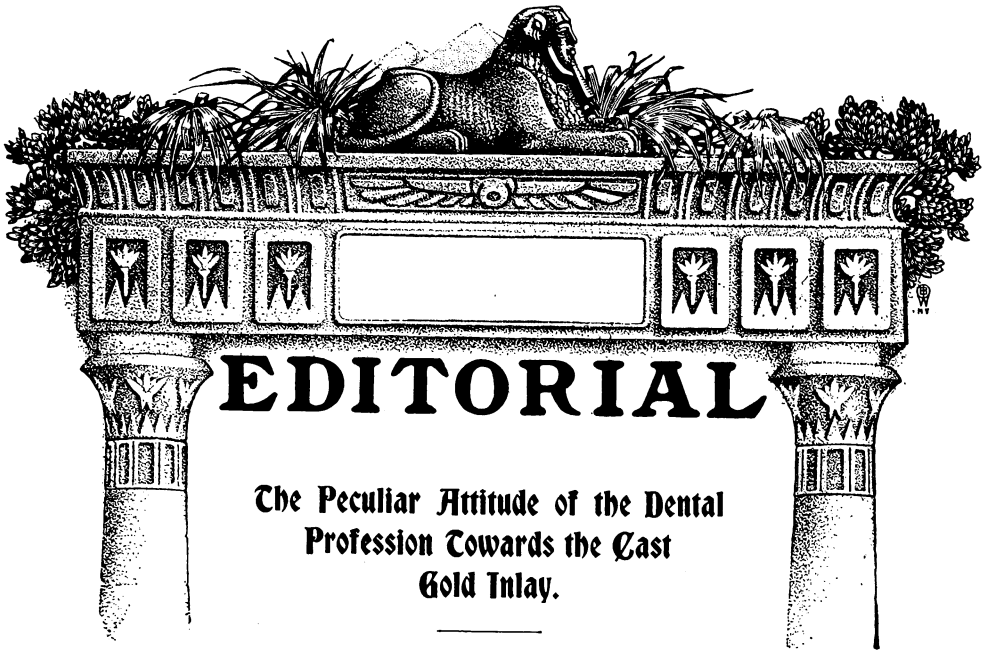
As to what Dr. Tracy asked, the crown is made over the ordinary inlay platinum, and that is taken out before cementation.

As to the two pins in the root which Dr. Hamlet criticized, if the drawings do not demonstrate where the two pins are, I am willing to be corrected. If he had a tooth like that shown there, two pins would be better.

As far as the perfect matching of color is concerned, many times a perfectly shaped crown will prove a better deception than a perfect color. You may have a perfect shade, and a poorly shaped crown, and it will be more noticeable, whereas if you have a good shape and not so good a color, it will be better.

I wish to thank Dr. Jenkins for the kind way in which he treated my paper. I am very glad to have been with you to-night, and I thank you all.





EDITORIAL

The Peculiar Attitude of the Dental Profession Towards the Cast Gold Inlay.

The antagonisms of the dentists toward process patents has created two great epochs in dental history. The profession first fought against the vulcanite patents, and subsequently against the International Tooth Crown Co. The position of ITEMS OF INTEREST in the latter instance is on record, and fresh in the minds of our readers. A great effort was made to induce Congress to amend the patent laws, so that no more patents on dental processes might issue. We succeeded, over the head of the Commissioner of Patents, who bitterly opposed the bill, in obtaining a favorable report from the committee, but just then the Spanish-American War intervened to keep Congress busy.

The argument against a purely process patent was coupled with an argument entirely favoring the patenting of dental instruments, appliances, etc., for just as the former must hamper the work of the dentist, and thus lessen his efficiency as a servant of the community, so on the other hand would improved appliances aid him; and without the protection of patents it is well known that manufacturers will not exploit novelties.

Before passing to a consideration of the Taggart patents, let us point out a common feature of those process patents which have thus far been antagonized by us. In the vulcanite patents, and in the Crown Company patents, the effort was made to collect royalties, or sell licenses, without furnishing anything tangible, neither appliances nor instruments being supplied.

The Taggart Patents.

Prior to the paper read by Dr. W. H. Taggart before the New York Odontological Society in January, 1907, the cast gold inlay was unknown in this country. At the present time there are about twenty inlay machines on the market, besides innumerable home-made devices for casting. What would this seem to indicate? Since so many inventors have so quickly produced casting machines since January, 1907, whereas none had done so prior to that date, it follows logically that there must be some fundamental, indispensable principle in common use by all devices, and divulged first by Taggart.

Analysis discloses that the basic idea, which has made possible the cast gold inlay, was *the making of a filling of wax, said wax filling then serving as a model for the metal replica.* It may surprise some in the profession to learn that Dr. Taggart, aside from taking patents on his apparatus, was awarded a patent on this idea or process. Up to date we have heard of no effort on the part of Dr. Taggart to exert this process patent against the dental profession, and we sincerely trust he never will. But what must we think of the members of the profession, who not only daily infringe this patent, but do so with machines made and sold in competition with the Taggart machine? The average fee for a gold inlay is from ten to twenty-five dollars, and in complicated cases even more. Already many men have inserted over one hundred cast gold inlays. All of these have earned from one thousand to twenty-five hundred dollars in a single year out of Dr. Taggart's "idea." In what way have they repaid him?

Casting Machines.

The manufacturers of casting machines all sing the same song: "My machine is different from Taggart's." "The disappearing wax model is an old idea." "Casting under pressure is not new." "Using a sprue is ancient history." Other arguments of a like nature are

heard. But if you ask one of these inventors or manufacturers, "If all these ideas and methods are so old, why did you not perfect your casting machine prior to January, 1907?" the silence becomes oppressive.

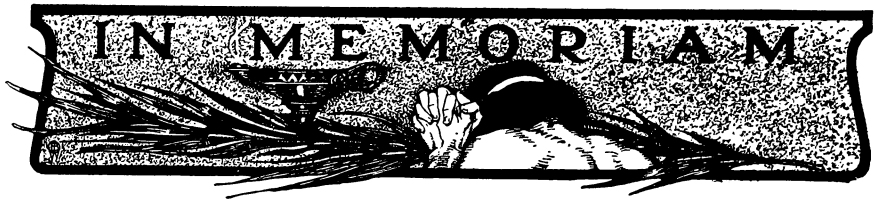
The truth is that casting under pressure, the use of a sprue, and the disappearing wax model, are all old ideas in the arts, but the combined use of these ideas and their successful application to the construction of a cast gold inlay appears to have been original with Dr. Taggart. At all events he holds a patent on this process, which is valid until set aside by the courts, and all who use the process without permission, and especially with rival machines, are clearly infringing, and consequently committing an illegal act.

Comparing this process patent with those that the profession has fought in the past, this difference may be pointed out. Thus far, at least, the Taggert process patent has only been held as a protection to the machine, and the purchasers of a Taggart machine naturally have the right to utilize the process.

That we may not appear inconsistent, let us point out that we have never argued that it is righteous to infringe a process patent. Our contention has been that it is unrighteous, and against the best interest of the community, for the Government to grant a process patent in dentistry or medicine. To this end we appealed to Congress, but since the appeal failed, as law abiding citizens we cannot forget that the process patent, however distasteful, is legal and must remain so until Congress amends the laws, or until the courts declare that all such patents have been wrongfully granted.

Meanwhile it is a deplorable fact that while thousands of dentists have been benefiting by the use of cast gold inlays, and while hundreds of competitive machines have been sold, Dr. Taggart himself, broken by his labors in perfecting the machine, the wax, the investment and the entire process, has been for weeks in Hot Springs trying to recover his health.

This certainly is a picture which should encourage all inventive minds to work in behalf of a grateful profession.



Dr. Frank French.

WHEREAS, On Friday, March 6, 1908, passed away from this life Dr. Frank French, at the age of 73 years.

Dr. French was born at Stafford, N. Y., January 7, 1835.

He received a common school education and took up the study of civil engineering and was for a time employed as such in Virginia.

He afterward studied dentistry and opened an office in Rochester for the practice of his profession in 1865.

His quiet, unobtrusive and gentlemanly demeanor gained for him an enviable clientele; this, and the character of his work, which, after many years, reflected the sterling integrity of the quiet, just and unassuming man, secured for him a leading place in his chosen calling.

His patients were steadfast and loyal; and while he had the respect of every member of the profession, he possessed a host of friends and admirers outside of his professional life.

Dentistry was his chief interest, and during an active practice of forty-three years he was prominent in all movements looking to its advancement.

He was a charter member of the Seventh District Dental Society, its first president, and was elected to this office on two other occasions, serving three terms.

He was a member of the New York State Dental Society, and as the representative of the Seventh District Society served for thirty-five years as one of the censors; the latter part of his term the title of the office was changed to that of State examiner; the duties remaining the same.

He was elected secretary of the board and faithfully, long and devotedly served in this capacity, refusing the nomination of president of the State society.

He was a charter member of this society, and as such we knew him best; faithful in friendship, equitable and just, kind and sympathetic, a wise counsellor.

He possessed many lovable traits, a fund of quiet humor and anecdote; a devotion to duty and high ideals; and once he was assured he was in the right, there was no compromise.

We shall miss his hearty greeting, his bright smile and warm handclasp.

In the language of Ingersoll, "He believed that happiness was the only good, reason the only torch, justice the only worship, humanity the only religion, and love the only priest. He added to the sum of human joy; and were every one to whom he did some loving service to bring a blossom to his grave, he would sleep to-night beneath a wilderness of flowers."

He had passed on life's highway the stone that marks the highest point, and being weary, lay down by the wayside, and, using his burden for a pillow, fell into that dreamless sleep that knows no awakening.

"He fought life's battles as best he knew, and without fear passed into silence and pathetic dust."

Resolved, That we, the members of the Rochester Dental Society, in session assembled, do record our deep sense of the loss which the dental profession, and this society in particular, have sustained; and be it further

Resolved, That we extend our heartfelt sympathy to the bereaved family, and that these resolutions be spread on the minutes and be published in the dental journals, and that copies be sent to the family of our departed member.

WM. W. BELCHER, Chairman,
F. L. SIBLEY,
W. A. WHITE,
Committee.

Dr. Sylvanus Davis.

Died at Denver, Colo., March 23, 1908, Dr. Sylvanus Davis, in the sixty-eighth year of his age from a complication of troubles, the immediate cause of his death being intestinal obstruction. Dr. Davis was born in Pennsylvania, November 20, 1839. In 1860 he entered the Union Army at the age of twenty-one, enlisting in the Second Ohio Volunteers, but because of sickness was discharged at the end of the first year. He graduated from the Pennsylvania College of Dental Surgery in 1871, and for a time practiced in western Pennsylvania. He was twice married, first in 1868 to Miss Nancy Wilson, of Pennsylvania, to whom

five children were born, and of whom but one, Mrs. Bryan Haywood, of Denver, is now living. His second marriage, in 1891, was to Mrs. Minnie Barnum, of Denver, who survives him. He was a resident of Colorado for thirty years, the first five of which were spent in Colorado Springs, and the last twenty-five in Denver. He was a charter member of the Colorado State Dental Association, organized in 1887, and was its president in 1898, and a member of the Denver Dental Association. He was an enthusiastic and loyal supporter of the Grand Army of the Republic, and was for many years a member of the George G. Meade Post, which later consolidated with the Byron L. Carr Post, of Denver. Dr. Davis was an original thinker and investigator in dental lines, especially in the earlier days of gold and porcelain work. He was a very generous man in giving freely to others such knowledge as he possessed, and was thoroughly ethical in his practice.

Dr. W. H. Guess.

WHEREAS, God in his infinite wisdom has removed from among the living our friend and brother practitioner, Dr. W. H. Guess, of Rogers, Texas.

Resolved, therefore, That in his death The Central Texas Dental Society and the dental profession has lost an able and earnest associate whose faithfulness for the highest principles of professional life and sympathetic qualities as a man endeared him to his colleagues, and to all whose privilege it was to know him.

Resolved second, That as a tribute of respect to him a copy of these resolutions be spread on our minutes, and a page in the minute book be set aside to his memory, and that a copy of these resolutions be sent to the dental press, and a copy to the family of the deceased.

DR. PITT S. TURNER,
DR. J. M. MURPHY,
Committee.

SOCIETY ANNOUNCEMENTS

National Society Meetings.

American Dental Society of Europe, London, England, beginning July 31, 1908.

American Society of Orthodontists, Washington, D. C., November 2, 3, 4, 1908.

National Association of Dental Examiners and the National Association of Dental Faculties, Back Bay, Boston, Mass., July 24, 25, 27, 1908.

National Dental Association, Boston, Mass., July 28, 29, 30, 31, 1908.

Southern Branch of the National Dental Association, Birmingham, Ala., May 12, 1908.

State Society Meetings.

Alabama State Dental Association, Birmingham, Ala., May 12, 1908.

Arkansas State Dental Association, Little Rock, Ark., May 26, 27, 1908.

California State Dental Association, San Francisco, Cal., June 9, 10, 11, 1908.

Colorado State Dental Association, Boulder, Colo., June 18, 19, 20, 1908.

District of Columbia Dental Society, Baltimore, Md., June 4, 5, 6, 1908.

Florida State Dental Society, Tampa, Fla., May 21, 22, 23, 1908.

Georgia State Dental Society, Augusta, Ga., June 2, 3. 4, 1908.

Illinois State Dental Society, Springfield, Ill., May 12, 13, 14, 15, 1908.

Indiana State Dental Association, Indianapolis, Ind., June 4, 5, 6, 1908.

Kentucky State Dental Association, Louisville, Ky., June 2, 3, 1908.

Lake Erie Dental Association, Cambridge Springs, Pa., May 19, 20, 21, 1908.

Maryland State Dental Association, Baltimore, Md., June 4, 5, 6, 1908.

Michigan State Dental Society, aboard steamer "Mackinaw" en route to the "Soo," Mackinaw Island and return, June 10, 11, 12, 13, 1908.

Minnesota State Dental Association, St. Paul, Minn., June 8, 9, 10, 1908.

Mississippi Dental Association, Jackson, Miss., June 9, 10, 11, 1908.

Nebraska State Dental Society, Omaha, Neb., May 19, 20, 21, 1908.

New Jersey State Dental Society, Asbury Park, N. J., July 15, 16, 17, 1908.

New York State Dental Society, Albany, May 7, 8, 9, 1908.

North Dakota Dental Association, Devils Lake, N. D., May 12, 13, 14, 1908.

Northern Ohio Dental Association, Canton, Ohio, May 26, 27, 28, 1908.

Ohio State Dental Society, December, 1908.

Oklahoma State Dental Association, Muskogee, Okla., June 8, 9, 10, 1908.

Pennsylvania State Dental Society, Philadelphia, Pa., June 30, July 1, 2, 1908.

South Dakota Dental Society, Lead, S. D., July 22, 23, 1908.

Southern Illinois Dental Society, Greenville, Ill., October 27, 1908.

Southwestern Michigan Dental Society, and the Jackson Society, Jackson, Mich., April 14, 15, 1908.

Tennessee State Dental Association, Nashville, Tenn., May 7, 8, 9, 1908.

Texas State Dental Association, Dallas, Texas, June 11, 12, 13, 1908.

Vermont State Dental Society, Montpelier, Vt., May 20, 22, 1908.

Virginia State Dental Association, Richmond, Va., July 14, 15, 16, 1908.

Wisconsin State Dental Society, LaCrosse, Wis., July 16, 17, 18, 1908.

National Dental Association Clinics.

The prospects are bright for a most interesting clinic to be held in Boston upon the mornings of July 29 and 30.

Returns have been received from invitations sent out both for operative, surgical and table work. North, South, East and West will be well represented by able men of our profession who will make the clinic one of the valuable features of the meeting.

The Tufts College Medical and Dental School, on Huntington Avenue, where the clinics will be given, will afford ample opportunity for all who wish to attend.

The Local Committee of Arrangements will neglect nothing that tends for the comfort and enjoyment of the participating clinicians.

The following gentlemen are acting as state and district chairmen: Maine, New Hampshire and Vermont, Dr. A. J. Sawyer, Manchester, N. H.; Massachusetts, Dr. G. C. Ainsworth, Boston, Mass.; Rhode Island, Dr. Carl R. Lindstrom, Boston, Mass.; Connecticut, Dr. Ned A. Stanley, New Bedford, Mass.; New York, New Jersey and Delaware, Dr. C. E. Parkhurst, Somerville, Mass.; Pennsylvania, Dr. H. B. McFadden, Philadelphia, Pa.; Maryland and District of Columbia, Dr. Clarence J. Grieves, Baltimore, Md.; Middle Atlantic States, South Atlantic States and Southern States, Dr. F. W. Stiff, Richmond, Va.

The chairman has been greatly aided by the secretaries of the various state societies throughout the West in reaching available men for the clinics. He wishes to extend his hearty thanks for their co-operation.

It is no easy matter to arrange a clinic programme for a society whose members are so widely scattered, but encouraging reports are being constantly received which foretell a sure success.

GEORGE E. SAVAGE, Chairman Clinic Section.

Canadian Dental Association.

The Canadian Dental Association will hold its fourth bi-annual meeting in the normal school, Ottawa, Canada, on the 4th, 5th and 6th of August next.

LEONARD E. STANLEY, Secretary.

Michigan State Dental Society.

Annual Meeting and Boat Trip Combined.

The Michigan State Dental Society will hold its annual meeting on Wednesday, Thursday, Friday and Saturday, June 10 to 13, inclusive, on board the steamer "City of Mackinaw," on a trip through the Detroit River, Lake St. Clair, the Flats, and on to Mackinaw, and the "Soo." The total expense of the trip, including passage, meals, berth, will be nineteen dollars for the round trip, and all ethical dentists and friends are cordially invited to join us.

The principal feature of the meeting will be table clinics, good papers, a complete dental exhibit, and a good time.

Four days to find out what your fellow practitioners are doing, an ideal meeting under ideal conditions. Those desiring to have accommodations reserved for them should apply at once to Dr. O. W. White, 406 Fine Arts Building, Detroit, Mich., stating the number of persons in party, and whether it is family party or all men.

A deposit of five dollars is required for each reservation.

This courtesy will be greatly appreciated by the Michigan State Society and committee.

O. W. White,
Local Arrangement Committee.

Alumni Clinic of Washington University Dental Department.

Owing to the fact that the Missouri State Dental Association will hold its annual meeting in the city of St. Louis within one week of the date selected for the holding of the Annual Alumni Clinic of Washington University Dental Department, the Executive Committee have decided to postpone the clinics for this year.

The regular business of the meeting of the Alumni Association will be held on Thursday evening, May 21, at the college building, corner 27th and Locust Streets.

H. R. Faherty, Secretary.
2355 Lafayette Avenue, St. Louis, Mo.

Southern California Dental Association.

The eleventh annual session of the Southern California Dental Association will be held in Los Angeles, Cal., June 1, 2 and 3, 1908. Several prominent eastern clinicians will be present and a large and better display by dental manufacturers is expected.

CHAS. W. BENBROOK, Secretary.

Alumni Association, University of California.

The Alumni Association, Dental Department of the University of California, will hold its annual clinic on Monday and Tuesday, May 11 and 12, at the Affiliated Colleges, Parnassus Avenue, San Francisco, Cal. A programme of seventy-five excellent clinics with discussions will be presented.

HAROLD L. SEAGER, President.

Georgia State Dental Society.

The next meeting of the Georgia State Dental Society will be held at Augusta, Ga., June 2, 3 and 4. All ethical practitioners are cordially invited.

D. H. MCNEILL, Cor. Secretary.

Athens, Ga.

Mississippi Dental Association.

The fifteenth annual meeting of the Mississippi Dental Association will be held in the Senate Chamber of the Capitol at Jackson, Miss., on June 9, 10 and 11.

A special programme is being arranged and a large attendance is expected. All ethical practitioners invited. For further particulars address Dr. E. Douglass Hood, secretary, Tupelo, Miss.

Lebanon Valley Dental Association.

The thirty-third annual meeting of the Lebanon Valley Dental Association will be held at the Colonial Hotel, York, Pa., May 12, 13, 14, 1908.

An excellent programme of interesting papers, clinics and demonstrations has been arranged, and the social side has not been forgotten. All ethical practitioners are most cordially invited to attend this meeting. which promises to be the best in the history of the society.

H. Elmer Trostel,
H. W. Bohn,
Chas. E. Grim,
Committee.

Oklahoma State Dental Association.

The next annual meeting of the Oklahoma State Dental Association will be held in Convention Hall, Muskogee, Okla., June 8, 9, 10, 1908. Stalls for a large manufacturers' exhibit will be arranged as an extra feature. Just preceding the Texas meeting visitors may attend both meetings without loss of time as railroad facilities to Dallas are excellent. All ethical dentists are urged to attend and visitors from other States are cordially invited.

E. P. R. Ryan, Secretary.

Kentucky State Dental Association.

The Kentucky State Dental Association will hold its business sessions at Louisville, June 2 and 3. The regular programme will be cooperative with the semi-centennial jubilee meeting at Indianapolis, June 4, 5, 6, 1908.

Tennessee State Dental Association.

The Tennessee State Dental Association will hold its forty-first annual meeting in Nashville, May 7, 8, 9. A cordial welcome is extended to all ethical practitioners.

DeLan Kinney, Cor. Secretary.

South Carolina State Board of Dental Examiners.

The South Carolina State Board of Dental Examiners will meet in annual session at Columbia, S. C., on June 5, 1908, to examine applicants for license. For further information address,

B. RUTLEDGE, Secretary.

Florence, S. C.

Connecticut State Dental Commissioners.

The Dental Commissioners of the State of Connecticut hereby give notice that they will meet at Hartford, on Wednesday, Thursday and Friday, June 17, 18 and 19, to examine applicants for license to practice dentistry, and for the transaction of any other business proper to come before them.

On receipt of application blank filled in and sworn to and accompanied with fee of twenty-five dollars ($25) each applicant will be sent a number, which number will represent said applicant during the examination.

The practical examination will take place at Putnam Phalanx Armory, corner Haynes and Pearl Streets, on Wednesday, June 17. All prosthetic pieces should be tagged with applicant's number and handed to commissioners at 9 o'clock, Wednesday morning. Applicants whose numbers range from one to sixteen, inclusive, will be examined in operative dentistry at 10 a. m. Those whose numbers are above sixteen will be examined in operative dentistry at 2 p. m. All applicants whose credentials are accepted shall be entitled to take both the practical and the theoretical examinations. Credentials shall be examined at the Hotel Heublein, Tuesday evening at 8.30; and at Putnam Phalanx Armory at 9 o'clock, Wednesday morning.

On Thursday, June 18, the theoretical examination will be held from 9.00 to 11.00; 11.30 to 1.30; and 3.30 to 5.30. On Friday, June 19, from 9.00 to 11.00; and 11.30 to 1.30. Theoretical examination will be held at the State Capitol.

By order of the Commission,

GILBERT M. GRISWOLD, Recorder.

783 Main Street, Hartford, Conn.

Wisconsin State Board of Dental Examiners.

The next meeting of the Wisconsin State Board of Dental Examiners for examination of candidates for license to practice dentistry in Wisconsin will be held Monday, June 15, 1908, at the Wisconsin College of Physicians and Surgeons, Milwaukee, Wis.

Application must be made to the secretary fifteen days before examination. The candidate must be a graduate of a reputable dental college, or have been engaged in the reputable practice of dentistry for four consecutive years, or have been an apprentice to a reputable dentist for five years.

For further particulars apply to

C. S. McINDOE, D.D.S., Secretary.

Rhinelander, Wis.

Indiana State Board of Dental Examiners.

The next meeting of the Indiana State Board of Dental Examiners will be held in the State House at Indianapolis, beginning at 9 o'clock Monday morning, June 8, and continuing three days. All applicants for examination will be required to be present at this time. For further information address the secretary,

F. R. HENSHAW, Secretary.

Middletown, Indiana.

Kentucky State Board of Dental Examiners.

The Kentucky State Board of Dental Examiners will meet for the examination of applicants at Louisville, on the first Tuesday in June, 1908, at Louisville College of Dentistry, commencing at 9.00 o'clock a. m.

Each applicant for examination shall be required to deposit with the secretary of the board his or her recent photograph, with signature on the reverse side, both of which shall be certified to by the dean of his or her graduating college, or other parties acceptable to the board. Applicants must be graduates of reputable dental colleges.

Applicants shall be examined in the following subjects: Anatomy, physiology, materia medica, pathology, histology, operative dentistry, oral surgery, chemistry, metallurgy, prosthetic dentistry, crown and bridge work, oral hygiene, and dental prophylaxis.

Every applicant shall be required to insert two gold fillings; two amalgam fillings, impression, bite and articulating teeth of upper or lower denture; one bridge on model, consisting of one shell and one Richmond crown and two porcelain faced dummies; one gold or porcelain inlay or Logan crown; all to be done before the board.

A general average of 75 per cent. is required. Applicants will be graded upon a basis of 3-5 on practical work and 2-5 on theory.

Applicants must come prepared with instruments, engine and material, excepting bellows, blowpipe, lathe, stones and polishing cones, to do the above-mentioned work.

The board would advise the use of gold in the above bridge, as it would cost very little more than German silver after disposing of the bridge.

Application for examination must be made upon blanks furnished by the board and must be accompanied by a fee of $20.00 and the above-mentioned photograph, all of which must be filed with the secretary ten days before the date of examination.

J. RICHARD WALLACE, Secretary.

The Masonic, Louisville, Ky.

South Dakota State Board of Dental Examiners.

The next meeting of the South Dakota State Board of Dental Examiners will begin Monday, July 20, 1908, beginning promptly at 9 o'clock a. m., and continuing three days, at Lead, S. Dak. All persons desiring to take this examination must make application to the secretary, and send fee of $10 at least one week prior to the above date. No candidates will be received for examination who do not make application as above specified. Applicants are required to bring dental engine, filling materials, articulators, teeth, and all appliances and materials necessary to do crown and bridge work.

G. W. COLLINS, Secretary.

Arizona State Board of Dental Examiners.

The next regular meeting of the Arizona State Board of Dental Examiners will be held at Tuscon, Ariz., May 4, 5, 6, 1908. The fee of twenty-five dollars ($25) must be in the hands of the secretary twenty days before the date of the meeting.

For further information, address,

DR. J. HARVEY BLAIN, Secretary.

Box 524, Prescott, Ariz.

Mississippi Board of Dental Examiners.

The newly appointed Board of Dental Examiners for Mississippi consists of Drs. P. H. Wright, Oxford; L. B. McLaurin, Natchez; A. B. Kelly, Yazoo City; C. T. Shumaker, Poplarville, and E. Douglass Hood, Tupelo. All are members of the State Association and represent the most ethical class of practitioners in the State.

The board organized and elected Dr. A. B. Kelly, of Yazoo City, president, and Dr. E. Douglass Hood, of Tupelo, secretary. The board will meet to examine applicants May 19 in Jackson. For particulars and requirements address the secretary,

E. DOUGLASS HOOD.

Tupelo, Miss.

Oklahoma Board of Dental Examiners.

The Oklahoma Board of Dental Examiners will meet at Muskogee on May 14, 15, 16, 1908, for the purpose of examining candidates for license, as well as finishing up the registration of dentists of the Indian Territory side of the State that are eligible to registration under the constitution.

For further information and blanks address the secretary.

A. C. HIXON, Secretary.

Guthrie, Okla.

Arkansas State Board of Dental Examiners.

The next meeting of the Arkansas State Board of Dental Examiners will be held in Little Rock, May 21 and 22, 1908.

All applicants are required to pass an examination to obtain a license to practice dentistry. The examination covers all dental branches. No instruments necessary for the examination. Fee $15.00.

A. T. McMillin, Secretary.

Fifth and Main Streets, Little Rock, Ark.

Vermont Board of Dental Examiners.

The next meeting of the Vermont Board of Dental Examiners, for the examination of candidates to practice dentistry, will be held in Montpelier, July 6, 7 and 8, 1908, commencing at 2 o'clock p. m. on the 6th.

Headquarters will be at the Pavilion Hotel.

Application, together with the fee, $25.00, must positively be in the hands of the secretary before July 1.

Application and other blanks required, including information, can be had of

J. Holmes Jackson, Secretary.

Burlington, Vt.

Iowa Board of Dental Examiners.

The Iowa State Board of Dental Examiners will hold its next meeting for examination at Iowa City, June 12, 13, 15, 16, 17, 1908. Written and practical examination will be required. For further information address,

E. D. Brower, Secretary.

Le Mars, Iowa.